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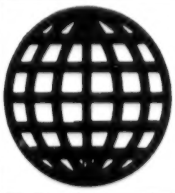

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France: CNRS Laboratory Makes Aluminum-Palladium-Rhenium Alloy

95WS0142A Paris COMPOSITES ET NOUVEAUX MATERIAUX in French Nov 94 p 6

[Article: "Aluminum-Palladium-Rhenium Quasicrystal: Alloy Makes Very Good Conductor"]

[FBIS Translated Text] The totally novel structure of AlPdRe quasicrystals has set new records for electrical resistivity in such alloys, reaching low-temperature values about a billion times greater than that of the aluminum which is its main component. These results, made public at the Physics '94 expo in Paris, were recently obtained by physicists at the Laboratory for the Study of the Electronic Properties of Solids, a CNRS [National Scientific Research Center] facility located at Grenoble. And the resistivity increases dramatically at lower temperatures. It was found that its insulating properties are much greater than those of metals. Thus scientists expect it will be possible to obtain a quasicrystal that acts as a true low-temperature insulator while preserving specific properties (thermal, mechanical, etc.) that will doubtless have useful applications.

It should be noted that the properties of this new AlPdRe crystalline phase depend on the quality of the material (very few defects, very precise structure) and thus demand a fabrication process with very low tolerance for error. This is particularly difficult owing to the fact the process involves alloying metals that have very different melting points.

With the discovery of this resistivity, this new class of metal alloys is seen to behave much less like a metal than previous alloys.

Initial experiments seem to indicate that its behavior is quite different from that of conventional insulators.

Germany: High-Performance Polymers Combined in Chemistry

95WS0153B Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German 12 Jan 95 p 8

[Article by Arno Noeldechen: "High-Performance Polymers to Provide Impetus for Further Development on Plastics Market"; Subheads: "Handful of Basic Components Can Combine in Plethora of High-Performance Polymers"; "Situation After Change of Strategy"; "Polymer Research"]

[FBIS Translated Text] Frankfurt—To be sure, the previously adopted development of relatively simple bulk plastics into expensive high-performance polymers has not panned out. They are too expensive for the most part for customers and, except for a handful of products, production quantities have remained low. The chemical industry, nevertheless, does believe it has grounds to hope that production and sales of high-grade polymers will continue to increase. Currently, polymer materials are under development that are tailored to their applications as well as "high-performance" polymers that are better able to cope with their tasks than most natural materials.

In the early nineties the awareness dawned that a small group of monomers was enough to combine polymers like building blocks into quite distinct properties. That motivated major plastics producers to alter their product policy. The switch from the hitherto prevailing strategy impacted basic research in particular that had devoted itself for almost a decade to specifically new developments.

Germany's chemical firms, therefore, are primarily banking on the familiar monomer components of propylene, ethylene or styrene. Those have been combined with one another into various structures and were blended with fibers for structural polymers. In this fashion, based on the experiences of industrial laboratories, high-grade materials have been realized that can be "designed" in a targeted manner or customized.

As a result of fresh combinations a plethora of novel polymers has been opened up that is still far from being exhausted. They derive their special properties through targeted polymerization that enables appropriately designing the molecular structures to the required standards. On the basis of observations by professor doctor Rold Muehlhaupt (Institute for Macromolecular Chemistry, Freiburg), 13 new monomers were discovered in the fifties and sixties. In recent years the only other addition was liquid-crystal polymers.

Most of the polymers produced from those, including polyether ketones and polyether sulfones, although displaying very high temperature resistance, still could be marketed only in several 1,000 tons as engineering plastics for special applications.

On the other hand, a large exponential increase is perceptible in the most diverse combinations of familiar monomers: from nine combinations in the seventies to more than 16 since the early nineties. In the process, monomers that, for example, could not be combined with one another in a solvent and therefore were considered "incompatible," were, however, successfully polymerized together. They included polymer blends, polymer alloys and polymer composite materials including compounds having inorganic components and fiber materials.

The polymer properties that can be created using this development strategy are virtually on a par with those of specialty polymers. They can be developed and produced, however, at considerably lower cost. Examples of such combinations are blends of polyamide and synthetic rubber (PA/EPDM [ethylene-propylene terpolymer), polycarbonate with acrylonitrile, butadiene and styrene (PC/ABS), polyoxymethylene with polyurethane (POM/PUR) and polypropylene also with synthetic rubber (PP/WPDM).

The lower sturdiness and impact-resistance of such thermoplasts compared with metals are offset by the addition of fibers. Polypropylene provided with relatively short

fibers, in fact, is already being used in sophisticated parts in engine design—as intake manifolds, for example—but in the future the desire is to "incorporate" lengthier fibers to realize even high mechanical resistances.

That is being managed in part through so-called coupling agents whereby the fibers are treated before processing so that they do not separate out of the polymer matrix and mechanical stresses can be diverted to the fibers. In the process those coupling agents mesh into the supermolecular structure of the polymers and form a new structural pattern. Special compression mold processes are also used in a production engineering mode.

The synthesis of the olefins ethylene and propylene has been considerably simplified through metallocenes (metalliferous catalysts). Those are chiral compounds involving zinc, titanium and zirconium on heterocyclical ring structures. Such catalysts function in such a target-oriented manner that concatenated polymers having side chains in various orientations can be realized.

The side chains may be oriented comb-wise to one side (isotactically), to both sides (syndiotactically) or even irregularly (atactically). The inclusion of such irregularities, combinations in block form or insertions of specific molecular groups expands the possible variations.

For example, highly resistant and simultaneously sufficiently elastic bumpers for passenger cars are being produced from isotactically designed polypropylene chains, that are a definite improvement over steel beam bumpers and are currently accepted by all automobile manufacturers.

Despite current experience in the development of new metallocene catalysts, there has still been no success in producing chain structures of any length whatsoever or precomputed lengths. The reason for an upper limit, from which no other larger molecules or higher mol masses can be realized, remains unknown. That is the reason for experiments with catalysts that function in a matrix fashion like DNA [deoxyribonucleic acid].

Catalysts capable of operating with ionized monomers and leading to an an- or cationic polymerization in which monomers concatenate and thereby form a chain structure, open up other possibilities. Professor Reimund Stadler (Institute for Organic Chemistry, Mainz) labels this "living polymerization" since the reaction of the active final molecules in macromolecular development is longer than the time required for the incorporation of all monomers. The result leads to a progressive polymerization as long as there is an availability of monomer building blocks capable of reacting.

There are block copolymers, for example, of styrene, butadiene and methylmethacrylate that can be produced through anionic polymerization. They display all properties of the individual components. They lead to layered, laminar structure in which polybutadiene in the form of a double helix twines around cylinder-shaped styrene structures.

They are crystal clear and could be used in optical components or optical switches or even, alternatively, for future optically functioning computers.

Germany: NMR Techniques Applied to Monomer Research

95WS0153C Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German 13 Jan 95 p 8

[Article by Erika Pomsel: "Useful Technological Possibilities of Familiar Monomers Still Far From Exhausted"; Subheads: "Nuclear Magnetic Resonance [NMR] Analysis Has Become One of Most Important Instruments for Clarifying Polymer Structures"; "Polymer Research"]

[FBIS Translated Text] Frankfurt—The intriguing thing about the new polymer structures is that they can be produced from long familiar monomers. This clearly indicates that their useful technological possibilities are still far from being fully exhausted. Under development, for example, are polymers for the following areas of application:

- even lighter packaging foils capable or not of breathing, as required,
- medical implants (provided long-term biocompatibility is demonstrated),
- automobile bodies, to realize further weight reductions and energy savings,
- in electronics, photoelectrically functioning switches and computer components,
- light-sensitive polymers for solar cells, electrolytes for more powerful battery systems,
- "switchable" polymers for elimination of light and energy savings,
- in molecular electronics, self-synthesizing and -organizing molecules as substitutes for semiconductor materials in transistors, light diodes and digital switches,
- as replacement skin, replacement teeth and membranes for artificial kidneys in medicine; such polymers might possibly in future even take over liver functions or be used as replacement intestines,
- regulatable microcapsules for releasing medications,
- as artificial antibodies and artificial genes (antisense compounds in gene therapy),
- for scratch-resistant polymer wafers (diamond coatings) or coatings.

In addition to polymer materials, there is also a diversity of possible molecular modifications for high-performance polymers that deserve attention: for example, vinylpyrrolidone, that was synthesized as far back as 1939. Such compounding of vinyl monomers with an attached pyrrolidone molecule is capable of application in cosmetics, foodstuff processing and even traditional pharmacy in a diverse variations. Biologically, polyvinylpyrrolidone (PVP) is highly compatible with tissue. Depending on its level of polymerization, it can range from hygroscopic to water insoluble and, with other polymers, be converted into copolymers.

As a complexing agent it is capable of forming heavy-metal ion complexes. Those can be used, among other things, to eliminate iron, copper or manganese from red wine. In the shape of a linked polymer it acts as an adsorption agent and is used to clarify beer or fruit juices since it especially binds phenolic organic materials.

Together with water-repellent vinyl acetate it is possible using polyvinyl pyrrolidone to produce hair-setting lotions that can meet the more recent regulations for solvent-free hair-setting lotions using greater amounts of water. In traditional pharmacy, polyvinyl pyrrolidone can be used both for improved pill cohesion and, in a less linked shape, exploiting hygroscopy, even for rapid dissolving of pills in water or in the stomach (as so-called quick-release pill agents).

The latest useful alternative is application in so-called melt-extrusion processes: in this, pharmacological materials and polyvinyl pyrrolidones are melted in extruders and then shaped into coated pills. Such coated pills simplify production since the resulting solution no longer requires further processing steps for protective coatings.

The melting also fuses the materials and in this way their subsequent release in the body is delayed: this means it is possible to make do with a lesser amount of materials and to prolong bioavailability for a longer period of time.

Currently, for exploring the molecular and supermolecular structure of polymers, the redeveloped or recently developed physical analysis processes at the Max-Planck Institute for Polymer Research in Mainz are being utilized and these go beyond knowledge of the structural design. Using them, structural motions that molecules or parts of them may perform can be detected and be related to the structure.

Such dynamically functional instrumentation is capable of revealing typical properties as external conditions alternate. In this way, for instance, nuclear magnetic resonance has become one of the most important analytical processes for the dynamic behavior of polymer molecules. In Mainz, even atomic surface structures of polymers have been made accessible to imaging using extra tunnel-electron microscopes modified for that purpose.

Nuclear magnetic resonance ([NMR), along with research activities, has developed into one of the most important instruments for explicating the structures and behavior of polymers. Under the supervision of its director, professor Dr. Hans Wolfgang Spiess, NMR has evolved in the meanwhile from one-dimensional to three- and even multi-dimensional technology.

It enables precise determination of polymer molecules in all three spatial axes in their dynamic behavior and, in the process, measurement of the angular degree of the chemical compounds and, hence, possible molecular modifications. Since such molecular modifications in combination determine structural changes and therefore the properties of a polymer, the use of this physical measuring method yields accurate measured values for control of properties.

Multidimensionality is realized via progressive irradiation in multiple radio frequencies that selectively stimulate different groups or molecules. This then makes it possible to ascertain elongations of the chemical compounds, the rotatability of individual groups or even their vibrations.

The measured results enable inferences to be made regarding the specific mechanical behavior that depends on such structural motions and this could lead to computing the flow properties that are so critical for polymer processing. Other measured values enable deducing such critical properties as electrical conductivity or optical nonlinear behavior.

Whereas earlier NMR technologies could only be used on liquids, now even solid polymers and their separate phases can be studied on the basis of a new operational technique developed at the institute. In addition to purely theoretical knowledge for polymer chemistry, more recent analyses using NMR technology facilitate unexpected, significant insights into the behavior of currently used polymers.

In this way it is possible, for instance, to correct the behavior of liquid crystals in display panels that are far from being able to be produced with complete uniformity. It was also possible for Spiess to demonstrate that even in such extremely stable polymers, such as nylon, free radicals do emerge and are capable of persisting for long periods. This means that the hardenability and corrosion resistance of nylon and similar compounds are less than hitherto assumed.

NMR analyses also enable dimensional measurements that were reserved for electron microscopes until now. In this way, for instance, hydrophilic domains in polycarbonate polyether membranes could be determined that are supposed to be used as permanent dialysis membranes for blood detoxification. Such areas in a primarily lipophilic material are crucial for biological functionability and biocompatibility. Because of the limited difference in contrast under the electron microscope, until now, no reliable measurement had been possible.

ERS-2 European Remote Sensing Satellite Discussed

95WS0146A Duesseldorf HANDELSBLATT in German 5 Jan 95 p 10

[Article by Wolfgang Engelhardt: "Leading Roll in Radar Observation of Earth; European Space Flight—Launch of ERS-2 on 21 January 1995"]

[FBIS Translated Text] **After telecommunications, earth observation is the most important field of application for modern space flight; the regular observation of the land, water and ice surfaces as well as of the atmosphere of our planet has the highest priority in the world-wide discussion on the environment.**

Bonn. The European space flight organization ESA is also participating in a special program on earth observation, though ESA is choosing for this job the modern radar technology which allows the earth's surface to be recorded at night and under cloudy conditions. More than three years ago, the first earth- radar satellite (ERS-1) was launched with an Ariane rocket—it impresses scientists and the public still today with its radar images which are sharp and very rich in content. At the ESA ESTEC technology center, the most recent results of the first European earth observation satellite were recently presented and the tasks of the ERS-2, which is to be launched in January of 1995, were described.

Radar Transmitters Work Also at Night and in Cloudy Conditions

As important as the high-definition photographic or electronic satellite observation in the visible spectrum is for military and certain civilian purposes, so too have radar satellites become valuable for many geoscientific uses, even if the resolution using this method of obtaining pictures is not so good at 20 to 30 m. But to make up for this, a radar sensor can be activated at any time to photograph a specific area, that is, also at night and in cloudy conditions when optical sensors fail completely. This advantage also compensates for the limitation that satellite radar can only be activated for 10 to 15 minutes during each orbit because of its high energy consumption and because of the enormous data stream of 1,000 megabits per second which can only be transmitted directly. Optical photographic systems such as SPOT or LANDSAT, however, attain photographic time periods which are hardly any longer because of the fact that it gets dark at regular intervals on the night side of the orbit and because of intensely cloudy conditions.

In spite of the technical limitations, the "synthetic aperture radar" on the ERS-1 satellite has, in the three years it has been in use, already taken more than 500,000 radar images of water, land and ice surfaces each 100 x 100 km in size. These always interesting and often aesthetically very appealing black and white radar images have proven to be of valuable help to many geoscientists. The other sensors installed on the ERS also provide the experts with valuable information on temperatures, wind currents and water movement on the earth as well as on changes in the atmosphere. In addition to countless scientific projects, the quick relay of the data also makes numerous practical uses of the ERS measurements possible.

Even after three years, the ERS-1 satellite built by the German DASA [German Aerospace Company] **Dornier** as the primary contractor is functioning superbly with almost no technical defects. There are now 23 stations circling the globe for the direct reception of radar data; the German Aeronautics Research Institute has even set up a mobile SAR receiver antenna in the Antarctic to receive radar images for the first time from this icy wilderness which has so far remained almost completely unexploited.

The largest and most important sensor on the ERS satellite is the so-called synthetic aperture radar (SAR), whose huge antenna records an area roughly 100 km wide from orbit with 25-meter resolution. The active sensor beams microwaves to the earth's surface and receives the reflected echoes which have been altered in a way which is characteristic of each landscape. Above all, such a radar sensor can also register the fine structures in large water and ice surfaces and thereby yield information on the prevailing wind directions and intensities. On the mainland, too, the radar images indicate pronounced structures: they differentiate among mountains and deserts, agricultural zones and forests, with the courses of rivers in between.

Scientists have also come to learn how to interpret the contextual meaning of this new type of information contained in these radar images. The ERS radar images of earthquake areas, volcanic eruptions, flood zones and areas of forest destruction in the Amazon region caused a sensation.

With the ERS-2 launch now planned for 21 January 1995, a flood of data—the expects hope—should be assured for another three to four years, until the first polar platform is launched in 1998. The new satellite is in terms of technology and instrumentation nearly identical with the first ERS, a few small changes have been made to the sensors. The greatest attention is being paid to the "global ozone monitoring experiment" in which the endangered ozone layer in the upper atmospheres will be continuously monitored. Furthermore, the "along track scanning radiometer" (ATSR) is receiving an additional channel for visible light. And naturally the ERS-2 again contains a PRARE sensor (precise range and rate experiment) for precisely measuring the orbit and the globe: this sensor failed right after the launch of the first satellite.

With the simultaneous operation of ERS-1 and 2, Europe is taking over the leading position world-wide in satellite observation of earth using advanced radar technology. The Americans made a start with this in 1978 with the SEASAT, which unfortunately was operable for only a short time; since then they have launched a few shuttle flights with large radar antennas in the cargo hatch of the orbiter. These missions in earth resources technology, however, only lasted a few days each, like the radar lab operation in spring of this year [tenses as written]. Here for the first

time a multispectral radar sensor was on board, two of the three antennas were contributed by Germany and Italy: Europe is thus fully engaged in this new technology. Scanning the earth with three microwave frequencies simultaneously is similar to color photography in the visible spectrum and provides a great deal more information on the composition of and changes in the regions of the earth which are recorded.

Possible Cooperation with Russia and Japan Ahead?

It is possible that there may soon be an international cooperative effort in the area of ecological satellite observation of earth, since Russia and Japan have also in the meantime launched such radar satellites and are planing to use additional types of models. The new multispectral observational technology will also certainly soon become part of the general standard in radar satellites. However, that naturally does not make further development of the conventional earth observation satellites with high-definition optical sensors superfluous.

The unexpectedly long life of ERS-1 and the upcoming launch of the successor model now give geo-researchers the unique chance to use both satellites in tandem, so to speak, and to scan our planet with radar at short intervals around the clock. On the other hand, the technicians in the ground stations and the scientists will be facing the problem after the launch of ERS-2 of managing two satellites simultaneously and of having to process twice as much data in the same time.

France: Failure of Launches Alarms Arianespace

95WS0132A Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German 16 Dec 94 p 8

[Article: "Arianespace Gradually Getting Into Time Bind"; Subhead: "Insurance Premiums Soar in Wake of 3 Failed Ariane Missions"]

[FBIS Translated Text] Munich—The failed Ariane 4 launch on 1 December entailing the loss of the U.S. PAS-3 multi-purpose satellite upset the insurance industry. It was already the third failure that year. PAS-3, its launch and initial start of operation carried $214 million worth of insurance. The premium totaled 17.5 percent.

On 24 January, Arianespace had to swallow the loss of an Ariane 4 with two communications satellites, Turksat 1 and Eutelsat II-F5, that had been insured for $356 million. On 8 September, AT&T's Telstar 402 satellite failed to work immediately after a successful launch. At that point in time it was still insured for $190 million.

For 1994 insurance experts are projecting at $220 million the net loss of the insurance companies around the world linked together by reinsurance contracts. That means that 1994 has been the worst year yet for that line of business. The upshot is that the insurance industry considers impacts on premium ceilings inevitable.

Effective immediately it is likely that no contract will be available for less than 20 percent of the insured value. It is even possible that well-known companies will pull out of this line of business, as already happened back in 1990, when at a single stroke a total loss of $60 million had to be chalked up.

There is some alarm since the 1 December crash of Ariane 4, just as back in January, is also attributable to a third-stage failure. The operating company, Arianespace, vigorously contests any connection. In January an overheated liquid oxygen feed pump failed shutting down the third-stage thruster after 80 seconds of burn time. This time, as far as known, the gas generator for a cooling system operated at only 70 percent of its standard capacity for 12 minutes. That was insufficient to lift the PAS-3 satellite weighing 2.95 tons into the initial orbit.

The length of the launch delay at Kourou this time basically hinges on the study commission that was immediately set up. Following the launch failure in January, the operation in Kourou stood down until 17 June.

Arianespace is now gradually getting into a time bind. There is an obligation to make good failed launches on a priority basis. On top of these there are a number of priorities that cannot be handled in the meantime as a result of the anticipated rather lengthy launch delay. What is more, Arianespace is carrying in its order books 41 regular satellites to be lifted into orbit by 1997. That is creating considerable deadline pressure.

Joint European Program for Research in Automobile Electronics Announced

95WS0159A Munich ELEKTRONIK in German 10 Jan 95 pp 16-17

[Article: "In Pole Position with 'Micromobile'"; subhead: "Europe Redoubles R&D Efforts"]

[FBIS Translated Text] **The working program, "Micromobile," defined in a joint action by industrial firms should continue the progress by European manufacturers of automotive electronics in worldwide competition. The gamut of proposed research and development [R&D] projects proposed in the micromobile white book ranges from modular plug-in connector designs to highly demanding image processing applications.**

The micromobile working program was defined in the period between November 1993 and April 1994. The resulting recommendations are now available for the entire industry as a white book and should lead to concrete European development projects. In the micromobile context the needs of automobile manufacturers, suppliers and microelectronics producers were investigated. Frank-Dieter Maier, managing-director and chairman of Temic Telefunken Microelectronics GmbH [Limited], recently introduced to the press for the first time this study on which more than 70 firms plus institutes and universities from 14 different European countries jointly worked. A consortium headed by Daimler-Benz had overall responsibility. Other drafters included Fiat, PSA Peugeot Citroen, Rover, Volvo, Bosch, Magneti Marelli, SGS-Thomson Microelectronics and Temic.

The white book's recommended R&D activities affords automotive electronics suppliers an enormous market potential. The reason is that the "level of penetration" of electronics in automobiles, currently at two to five percent of a car's production value, remains rather modest. To be sure, in top-of-the-line vehicles, it is already up to 20 percent. The example of an equivalent car having approximately microcontrollers, 60 step motors, three kilometers km of cabling and 2,000 connections, however, makes the growth potential of automotive electronics highly obvious.

By the year 2000, in the estimation of the experts, the percentage of electronics in the production value of a standard mid-range car will constitute 20 percent on average. Top-of-the-line cars in this context will remain the trendsetters for the use of innovative microelectronics with an even higher percentage. In what areas can further advances in automotive electronics currently be expected? Central themes surely include more performance and at the same time greater integration of components and systems. Even self-styled mechatronics, that is, increasing integration of electronic modules and functions in mechanical units, is growing in importance. Furthermore, advanced bus systems that link various electronic modules with one another and facilitate bidirectional communication, will play a crucial part.

The requirement for further innovations in automotive electronics includes, first, new semiconductor, packaging and assembly technologies and, second, powerful design tools. The following five thematic foci were derived from these in the micromobile working program:

- systems,
- methods,
- allied technologies,
- linkage technologies and
- microelectronics technologies.

The systems focus entails high-level aspects of the integration of electronic systems, for example, for enhancing safety. Simulation of system behavior—in fact, in the interaction of mechanics and electronics—plays a major role here. For this reason the micromobile white book proposes, among other things, a redoubling of efforts for the development of programs that facilitate integrated systems models. Even new requirements in rapid-prototyping designs are to be viewed in this context. To push ahead here with the transition from offline to online simulation, powerful tools are called for that automatically generate source codes and are capable of analyzing the configuration and performance of multiprocessor systems.

Systems Know-How from Development to Recycling

Moreover, micromobile paladins advocate a universal tool framework embracing integral systems know-how from development to recycling. Such R&D efforts are described in the micromobile white book under "methods." These are interpreted as not only integrated tools for design and simulation of electronic systems but also their integration into the automobile. Falling into this category are also new methods of cost analysis capable of supplying electronics systems at the most favorable possible price.

Future, powerful tools that will help, among other things, significantly to improve possibilities for diagnosing flaws, will be equipped with a graphical user interface [GUI] and be capable of running under MS [Microsoft] Windows. This requirement coincides with the current trend and should no longer be particularly difficult to meet. Much more demanding are the goals of micromobile's advocates in terms of a trouble-free exchange of product model data. Considerable preliminary work has already been performed here in the ProSTEP consortium that is, in fact, essentially being run by the automotive industry. The acronym STEP stands for "Standard for the Exchange of Product Model Data" and describes a uniform interface for the exchange of product data. At the moment, STEP is naturally still highly focused on the mechanical sector. Interaction with electronics is considered only on the printed circuit board [PCB] level. Currently, there is supposed to be intensive integration into STEP of design standards from microelectronics—for example, the hardware description language VHDL [very-high-speed hardware description language] or the EDIF [Electronic Data Interchange Format].

Image Processing in Focus

The micromobile thematic complex "allied technologies" entails, among other things, sensors and actuators, micromechanics, microoptics or microhydraulics that are

capable of supplementing microelectronic systems. An outstanding application of such technologies is image processing that, for instance, can be used for timely detection of a risk of accident; and, in fact, in the form of highly dynamic cameras, enable image processing and pattern recognition in real time. Laboratory samples of appropriate chips already exist—among other things, as the R&D result of the European program PROCHIP.

More Safety with Improved Airbag Systems

The ongoing development of airbag systems also has as its goal enhanced safety. Airbags currently are primarily still used as protection for the driver in head-on collisions. Future airbag systems should protect all passengers. That will require cost-effective and reliable sensors to measure acceleration and that will detect the deceleration momentum of a crash and generate the signal for activation of the airbag. Appropriate single-chip solutions are already in the R&D stage. The self-styled adaptive airbag activation remains a futuristic dream: here the airbag adapts itself to the current conditions of the accident such as direction and force of the collision or the bodily conditions of the passengers (weight, for instance).

On-board databus systems, cable harnesses and plug-in connectors plus communication with the "environment" are themes that are supposed to be dealt with in the micromobile R&D focus "linkage technologies." Although seldom the focus of interest, a technological revolution can be anticipated precisely for plug-in connectors. Such components will increasingly have to guarantee reliable transmission of complex signals. Each plug-in connector contact therefore will have to be specifically customized for the nature of the transmitted signal plus the respective environmental influences. To avoid any incalculable diversity of variants here, modular plug-in connection designs are to be developed employing standardized components. The trend, furthermore, is to miniature plug-in connectors. The present dimension of such electromechanical components continues to impose severe limits on the miniaturizing of electronic systems in the automobile.

As regards cabling, the use of optical fibers remains a current theme because of higher transmission speeds and security aspects. Some efforts are still required here, however, to render this transmission medium more cost-effective and insensitive to the impacts of heating.

Advanced Smart-Power Designs

The microelectronics technologies program focus concentrates on highly integrated switches, multipurpose ICs [integrated circuits], multichip systems and enhanced performance through digital signal processing, smart-power and mixed-signal technologies. What is more, this entails new cost-effective and reliable packaging and assembly technologies.

The drafters of the micromobile white book included among the central themes advanced designs in the smart-power sector. In this context the future surely belongs to chip solutions that combine multiple technologies on a single component: bipolar CMOS [complementary metal-oxide semiconductor] and DMOS processes having insulated power DMOS elements, bipolar transistors and CMOS logic. Combining such processes facilitates multipower outputs and local intelligence with extensive insensitivy to failures and tremendously reduced power consumption. With further scaled-down CMOS structures, smart-power microsystems will be possible in the future that will offer the sophisticatedness of VLSI [very large scale integrated] chips.

In the case of microcontrollers, suppliers of automotive electronics will bank even more intensively on standard components that will be used in connection with ASICs [Application-Specific Integrated Circuits] for input/output functions. Additional functions such as protocols (CAN [Controller Area Network], VAN, J1850), timers or signal processing will, in fact, have to "be based" on the microcontroller in the long view. But some time will still elapse before that time. Still, according to Temic's director, Maier: "The R&D activities defined in the micromobile working program will strengthen the competitiveness of Europe's automotive industry. Micromobile will also ensure that there will be able to be innovative microelectronics applications from Europe even in other areas of application in worldwide competition." To be sure, he is not alone in this view. A number of individuals knowledgeable of the international automotive scenario concede to Europe, for the time being, a strong lead over the U.S. and Japan.

Germany: Status of Batteries, Fuel Cells for Automobiles Noted

95WS0143A Duesseldorf HANDELSBLATT in German 4 Jan 95 p 15

[Article by Werner Osel: "Niche Cars for the City; Electric Cars—Automobile Industry Still Has Much to Wish for in Batteries"]

[FBIS Translated Text] **Only with rigorous federal intervention does the electric car stand a chance in the foreseeable future. Because it will be a long time before the electric cars are able to pose any threat technically to the mature vehicles with gasoline and diesel engines.**

At the end of 1994, Volkswagen AG presented in the Golf CitySTROMer [CityElectricCar] the "first mass produced electric car." For the time being, 100 cars are to roll off the production line for the Energieversorgung Suedsachasen AG [Southern Saxony Power Supply AG] in Chemnitz. Instead of a gas tank, the car has a battery of the proven lead-gel type with a nominal voltage of 96, it weighs a full 480 kg and has a three-year warranty from VW.

To conserve the battery, the car has a fuel heater. Electricity runs a synchronous motor with a continuous output of 17.5 kW which brings the car in motion by means of a regular manual transmission and a standard clutch. The chassis and the brakes are also the same as those on the regular Golf.

The car holds a battery charger and voltage converter for recharging from the power outlet, which in city driving is necessary every 50 to 60 km. At 80 km/h the [Golf] electric car also has travel range of about 80 km. Its top speed is 150 km/h, it goes from 0 to 50 km/h in 13 seconds. With four seats, the Electric Golf costs a full 49,500 German marks [DM].

But "for the foreseeable future, the electric car will remain a niche vehicle for use within the metropolitan area because of its limited travel range," in the judgement of BMW AG, which already sent its first electric limos through the city in 1972 during the Olympic Games in Munich. Test cars with sodium-sulphur batteries have been in operation since 1986. Beginning in 1991, the first prototypes of the E1, which was developed for city driving, of the E2, developed for California, and then, in the meantime, of the Electric-3, developed for the large-scale production trial on the island of Ruegen, arrived on the scene.

Still: battery systems so far have not done a good job of meeting the demands of vehicles. In the foreseeable future batteries will not be able to replace the fuel tank. It's true that high-performance batteries have developed to the point where they can store four times [as much energy] as a lead battery, but a 60-liter fuel tank holds roughly 500 kWh and thus 60 times as much as an equally large and 80 times as much as equally heavy battery. In addition, there are the shorter life span and thus higher costs of the battery, the shorter travel range and the diminished performance of the car.

This, then, is the wish list from the auto industry: the batteries must be low-maintenance and operate at external temperatures of minus 20 to plus 50°C. They should last four to five years and more than 40,000 km. The energy density should reach 80 to 100 Wh/l and the power density 100 W/l. Finally, the battery should cost from DM350 to at most DM450 per storable kilowatt hour. All this is still a long way off.

Here are the most important types of batteries used today in motor vehicles along with their characteristics:

- The conventional lead-gel battery can store 50 Wh/l volume, has a power density of 175 W/l over 5 minutes and an operating temperature range of 5 to 50°C;
- The nickel-cadmium battery with 60 Wh/l energy density and 200 W/l power density at -20 to +45°C;
- The zinc-bromine battery with 35 Wh/l and 72 W/l at -5 to +45°C.

These "cold" batteries are state of the art and are available as products. Greater energy densities are offered in hot systems such as:

- The sodium-sulphur battery with 80 Wh/l energy density and 110 W/l power density over 5 minutes, but with an operating temperature of 290 to 330°C;
- And the sodium-nickel-chloride battery with 90 Wh/l and 110 W/l at 270 to 300 degrees.

These "hot" systems must be kept at 300°C even when [the car is] parked. The sodium-sulphur battery, developed by ABB [Asea Brown Boveri], was "temporarily retired" for the time being after two battery fires in the U.S. ABB wants to keep the technology for itself but is suspending further development and even production due to "lack of demand." BMW engineers are currently expecting the most from the hot batteries with sodium-nickel-chloride, which they are putting into their E1 and E2 electric cars and the Electric-3.

Daimler-Benz is taking a totally different approach. Instead of taking electricity along in a battery, the vehicles have a fuel cell on board which is run with hydrogen. William Grove made this underlying innovative change already in 1893. Fuel cells have already been used to supply electricity in U-boats and space capsules. A small transport vehicle at Daimler-Benz already has many kilometers behind it. Admittedly, the "power plant" still takes up practically all of the cargo space, which graphically explains one of the goals of development.

The principle: inside the fuel cell, hydrogen from a tank in the car combines with oxygen from the air to make water, the only "exhaust" which is produced. In the process, energy is not released as free heat but is instead transformed directly into electric current within the fuel cell, chemically and without moving parts. The efficiency of this direct path is many times greater than is the chain of events from coal, oil or nuclear energy to electricity via the battery to the automobile engine. With hydrogen in a tank the size of conventional gas tank, the vehicle also has about the same travel range as the gas-powered car.

Of the three current approaches to the problem—MCFRC or molten carbonate fuel cells, SOFC or solid oxide fuel cells with an especially high level of efficiency at 1,000°C, and PEMFC or polymer electrolyte membrane cells—Daimler is further developing the PEMFC for use in motor vehicles. It only needs an operating temperature of 20 to 100°C, is especially flexible in operation, has a high power density and can be built in systems which are small enough for vehicles. However, even the developers characterize as "optimistic" the notion that a completely normal passenger car will come from the experimental car in the not too distant future. For the time being, even at Daimler electric cars are still being built with batteries.

The electric car, whether carrying batteries or fuel cells, will not switch from test drives to the fast lane until circumstances change. Examples are California, which demands from the manufacturers a fixed proportion of exhaust-free models, and spas which ban gasoline and diesel-powered vehicles and switch to electric busses. Some environmentalists want to force up taxes on mineral oils so high that the electric car is considered an alternative. Only rigorous economic interventions can make a considerable part of the traffic on the roads electrically [powered] in the foreseeable future. Technically, the electric motor ...ill has a long way to go before being able to drive off with the mature gasoline and diesel engines.

Germany: Physics Database Established at FIZ Karlsruhe

95WS0132C Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German 19 Dec 94 p 10

[Article: "Largest Physics Database at FIZ Karlsruhe"]

[FBIS Translated Text] Frankfurt—As of January 1995, with the Inspec on-line database, the most comprehensive listing of specialized literature on physics will become available. The new version of the database is being produced jointly by the British Institution of Electrical Engineers [IEE], London, the German Specialized Information Center (FIZ), Karlsruhe. The merger opens the way to the largest and most comprehensive listing of physics literature in the world.

By the end of this year, Inspec will have stored nearly 2.9 [as published] physics seminar papers and Phys will come to 1.9 million. There is reportedly also about a 75-percent overlap in content. Inspec is the product of Germany's physics literature database Phys and Britain's Inspec. Phys was the electronic output of the seminar paper organ Physic. Briefs, while Inspec was an IEE database that was based on the seminar paper services Physics Abstracts, Electrical & Electronics Abstracts and Computer & Control Abstracts. The new database, purged of duplicates, will then have stored nearly 3.5 million references to specialized literature. Altogether, in the future Inspec is likely still to be expanded by nearly 180,000 citations.

FIZ Karlsruhe (P.O. Box 2465, 76012 Karlsruhe / Fax 07247/8 08-259) will also offer the electronic Firstsearch library in the future, containing listings of 4,000 library catalogs. Firstsearch, from Online Computer Library Center (OCLC), Dublin (Ohio), is specifically designed for libraries and their users. The core offering in this context is the OCLC Online Union Catalog holding more than 31 million documents.

France: Apache Cruise Missile Tested, Described

95WS0136A Paris SCIENCE ET VIE in French Dec 94 pp 98-101

[Article by Germain Chambost: "Deterrence: The Non-Nuclear Solution"]

[FBIS Translated Text] *With the Apache, France has now tested its first cruise missile. Flying toward their target several hundrea kilometers away, at a speed of 1,000 km/hr, and difficult to detect, cruise missiles provide a new deterrent weapon of choice.*

We are in year 2001, and installed in the Near East is a new fundamentalist dictatorship, which, stepping up its terrorist actions, diverting commercial planes, and intercepting commercial ships, is increasingly posing a threat to France. How can France react without resorting to its nuclear deterrent force? By using cruise missiles. Equipped with a conventional military payload, and launched from a plane or a surface ship, they can hit command posts as a warning. Virtually undetectable, they are the supreme non-nuclear deterrent weapon.

The only truly new weapons program provided for by the French military program law covering the period 1994-2000 concerns cruise missiles. The French expression for this type of weapon *[missile de croisiere]* is a literal translation of the English term "cruise missile." The French Defense Ministry prefers to title this program *"Arme de Precision Tiree a Grande Distance"* [APTGD] [Remotely Launched Precision Weapon]. Simply stated, this weapon has a range of 1,000 kilometers and, launched at this distance from its predesignated target, it is capable of navigating fully autonomously to that target, without being guided by anyone, and striking it within a maximum error of 1 meter.

It will be recalled that during the Gulf War, the Americans made ordinary everyday use of cruise missiles launched from ships anchored distant from Iraqi shores, hence beyond the range of enemy aircraft. These were jet-powered drones, with short wings, and carried a military payload consisting of several hundred kilograms of explosive. These cruise missiles, the Tomahawks, achieved a success rate of between 66 and 85 percent, depending on the mission. In the June 1993 reprisal raid against military targets located in Baghdad, the Tomahawks were again launched from warships present in the Gulf. In this way, the Americans avoided having to use piloted planes, thus reaping a dual advantage: they avoided risking the lives of their crews, and they avoided involving Saudi Arabia, from which their planes would have had to take off, and which had expressed its reluctance with respect to the proposed operation. This example illustrates the military as well as political value of this type of weapon.

To be able to navigate autonomously to their target, cruise missiles make use of means that are independent of ground-based facilities, since the missiles have to fly over territory that by definition is hostile. They certainly cannot expect to rely on radio beacons along the way as could an ordinary commercial airliner. Nor can they use a radar, which can "see" the landscape far ahead and to the sides of the missile, and in all weathers, but whose transmitted beams are extremely betraying and facilitate detection of the missile. On the other hand, an inertial navigation system offers decided advantages when associated with the GPS (Global Positioning System) and a topographical relief analysis system (see illustration page 100) [not reproduced, but see related Box p. 100 following main body of this translation].

Generally speaking, current cruise missiles travel at subsonic speeds. That is the case of the Americans' Tomahawk, for example. It will also be the case of France's Apache, operational testing of which began last summer above the Landes Testing Center. Developed by the Matra company, with Aerospatiale as the principal cooperating partner, the Apache weighs 1,200 kg and can carry different conventional, non-nuclear payloads. It is propelled by a small, fuel-efficient, 550-kg-thrust turbojet. The Apache is scheduled to become operational in the French and German Air Forces in 1997. During current testing, the Apache has been launched from a Mirage 2000 at 140 km from the target assigned to it. It traveled this distance in 8 minutes, or at a speed decidedly below the speed of sound.

Flying at 600, 800, or 1,000 km/hr depending on the model, but at mere tens of meters above the ground, and built of materials that render detection difficult, the characteristics of cruise missiles enable them to avoid being spotted and to evade antiaircraft missiles and guns. Furthermore, from a strategic standpoint, when attacking zones heavily fortified with surveillance radars and means of interception, they render it feasible to send in a sufficient number of cruise missiles to saturate these defenses. Even if a large proportion of cruise missiles is destroyed before reaching the target, there will always be a few left to strike it.

One cruise missile, however, is an exception to this rule, and it is French, namely, the ASMP (Medium-Range Air-to-Surface Missile) missile built by Aerospatiale. But that is because this is a nuclear missile designed to carry a nuclear warhead. In this case, it is out of the question, to sacrifice several missiles of this type "hoping" that the survivors will strike the target. ASMP's are launched one by one, and each is expected to hit the target.

The ASMP, launched from a Mirage 2000 or a Navy Super Etendard, travels at a speed greater than three times the speed of sound, rendering it invulnerable. It is powered by a ramjet, a technology in which our country possesses exceptional know-how (see SCIENCE ET VIE No. 923, page 100), and which alone enables the maintaining of such speeds for significant periods, hence of appreciable distances.

The question having to be addressed today, therefore, is: What is to be the solution finally adopted for the future French high-precision, long-range missile? A subsonic missile derived from the Apache, requiring only an increase of

its autonomy to impart to it the desired characteristics? Or a "super" supersonic missile equipped with a ramjet like Aerospatiale's ASMP? The decision on this question must not be delayed. The more so in that the choice will necessarily entail consequences. Several countries, beginning with Great Britain, are planning to equip themselves with weapons of this type. And France, through Matra and Aerospatiale, fully intends to participate in the looming competition for this market. And, as is more and more often the case now, France can expect to find itself confronted by the United States, which is also determined to make the most, through export sales, of the technologies it has developed and refined.

[Box p. 100]:

Four Means of Attaining Its Objective

[Note: Numbers in parentheses are keyed to illustration not reproduced]. The cruise missile is equipped with an inertial navigation system whose gyroscopes furnish an inertial reference frame, derived from the heading being followed. Ultrasensitive accelerometers enable highly precise measurement of the missile's speed, hence, as a function of time, the distance traveled. After a certain period of navigation, however, errors may appear. They are minimal, amounting to but a few meters at most. But they are unacceptable in a missile that must hit a distant target of small size. Navigational accuracy is therefore enhanced by the GPS (Global Positioning System) (1), an onboard system that is referenced to military satellites (2) and that furnishes geographical position data as well as altitude data, both accurate to within a few meters. During the terminal phase of the missile's trajectory, it is aligned on the target (3) by means of a radar (4) with the image (5) of this target stored in memory, or by a camera that works in the same manner. The aiming can also be done by an operator who receives the images filmed by a camera placed in the nose of the missile. In the latter case, these images are retransmitted by a telemetering system protected against enemy jamming, and, in return, the operator sends commands by remote control.

The TRN (Terrain Referenced Navigation) system further narrows the navigational error: The zonal correlation system continually compares the radar image of the terrain (6) with the stored image (7). A correction is applied in the event the missile has drifted off-course (8). The terrain relief (9) is also compared with a 3D map stored in the memory of the computer (10), facilitating deduction of the missile's position and application of the necessary corrections (11). The terrain-following function is performed by means of a radio altimeter (12), which sends a beam down, captures the reflected beam and thus measures its height above the terrain, and then commands the automatic pilot that controls the missile to apply the necessary course corrections and to increase or decrease its altitude above ground as dictated by the relief. Since the missile's height above the ground is known to within approximately a few meters (vertical accuracy varies between three and six meters), and the details of the entire region being overflown is stored in the onboard computer's data bank, the missile's trajectory can be made to literally "marry" the relief. Thus, the cruise missile is virtually undetectable from the ground. It can only be pinpointed by airborne radars installed aboard surveillance planes, such as the AWACS, overflying the zone concerned, and able to "see" downward. Detection is in any case difficult, as the missiles are made of composite materials, rather than metal, and are moreover coated with paints that absorb electromagnetic waves. In addition, the jet exhaust nozzles are designed in such a way as to dilute the hot air ejected toward the rear, so as to lower its temperature and render the missile less easy to identify by means of infrared detection facilities that register temperature differences.

Photo Caption

1. [p. 99] The first French cruise missile. (1) Microturbo jet (550 kg thrust) and fuel tank. (2) Aerodynamic control surfaces; they are of reduced size so as to offer the least possible radar contact area. (3) Interchangeable container carrying the military payload, which may consist of a single charge or of submunitions that are ejected laterally or vertically depending on the targets being addressed. (4) Wings deployed when missile is launched. (5) Air intake designed to be cast integrally with the overall housing, to feed the jet. (6) Guidance, control, and navigation system (see Box p. 100 [above]).

French Defense Ministry Announces Missile Development Decisions

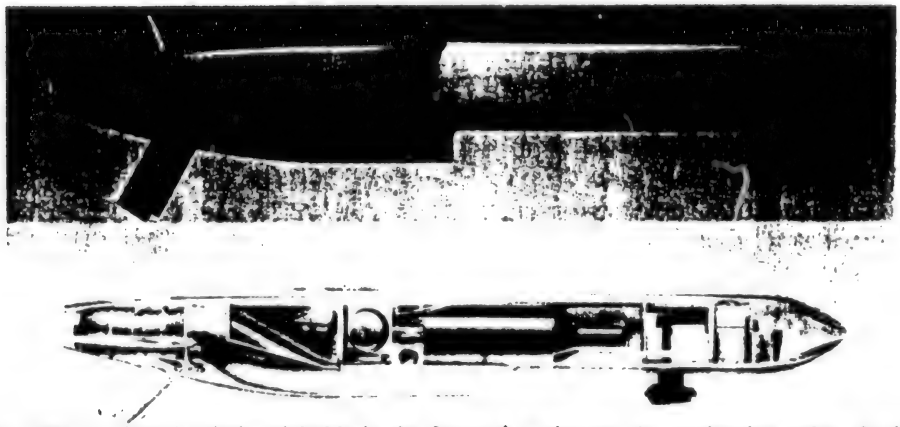
95WS0141A Paris AIR & COSMOS/AVIATION INTERNATIONAL in French 23 Dec 94 pp 51-53

[Article by Jean Dupont: "Matra Will Develop the 'APTGD' Cruise Missile"]

[FBIS Translated Text] *Matra has been awarded the APTGD [Remotely Launched Precision Weapon] program, as well as the contract for an Apache anti-infrastructure missile. Aerospatiale receives as a consolation award the future antiship missile program scheduled to get under way in 1997.*

Between the Apache C subsonic cruise missile proposed by Matra, and the Asura supersonic ramjet missile proposed by Aerospatiale, Defense Minister Francois Leotard has opted for the Apache C under the APTGD program. The development and production of this long-range cruise missile, as well as of the Apache anti-infrastructure missile, which has also been decided, will cost between 5 and 7 billion francs [Fr].

Francois Leotard announced in the same communique the launching of two other missile programs: for Matra, an Apache anti-infrastructure (single explosive charge) missile, and for Aerospatiale, a supersonic antiship (ex ANNG [New Generation Antiship Missile]) missile, which like the Asura is a close derivative of the ASMP [Medium-Range Air-to-Surface] nuclear missile. The decision to proceed under these programs appears to be aimed at imparting a little push in the right direction to the industrial alliances that the two rival French groups are in the process of



Mockup of the APTGD. Clearly distinguishable in the forward section are the navigation radar, the infrared-imaging seeker, which emerges from the body of the missile when the latter reaches a point 2 to 2.5 km from the target, and the 400-kg single-charge payload.

forming in Europe: Matra Defense with British Aerospace Dynamics; and Aerospatiale with German Aerospace.

Aerospatiale, Matra's principal cooperating partner (with a 44-percent share) in the current (anti-runway) version of the Apache, can also expect to benefit from its not insignificant 42-percent share in the new program. The APTGD, on the other hand, being considered a sensitive program, can neither be exported nor open to potential international cooperation.

The APTGD is the sole new program covered by the Long-Term Planning Law passed at the beginning of the year. Its concept is directly in keeping with the thinking that went into the drawing up of the White Book on Defense. It is a weapon that will enable France to deliver a strong signal to an enemy to curb a crisis or a conflict. In both the latter cases, the APTGD would be a weapon of choice to neutralize the enemy's vital installations (communications center, command center, etc).

These two scenarios, decidedly inspired by the Gulf War, embody a requirement for operational characteristics of an exceptional nature. The APTGD must be capable of accomplishing its mission with absolute certainty and without collateral effects, on pain of exacerbating the very crisis it was intended to extinguish through the use of this weapon, which is comparable to the U.S. Tomahawk.

The solution adopted will therefore will be a cruise missile, derived from the Apache, with a range between 400 and 600 km depending upon the launching platform. In its initial version, the APTGD will be an air-to-ground missile designed to arm the first squadron of Rafales in 2002. An extrapolated version equipped with boosters will enable it to be launched from a surface ship. And a third version will be launchable from the vertical tubes of the SNLE-NG nuclear attack submarine. For this purpose, it will be packaged in a capsule equipped with boosters, as is already being done with the Aerospatiale SM-39 antiship missile.

The APTGD will thus be the first weapon of this type built since the American Tomahawk, which was launched 20 years ago. Since it is a weapon designed to ensure national sovereignty, its use must not be exposed to foreign extortionate pressures of any kind. Its navigation must therefore be fully autonomous. To this end, the missile will incorporate an inertial system by Matra-Sagem, corrected by Thomson-CSF's Prometheus radar, whose reference images will have been correlated with a detailed map of the terrain, produced by French observation satellites, before being stored in memory in the missile.

In flight, the APTGD must be undetectable. To this end, the missile will track and follow the terrain, as it advances, at a height of 30 to 60 meters above the ground. Under these very-low-altitude flight conditions, throughout various simulations, the missile has proven undetectable even by AWACS radar planes.

A Weapon for the Exceptional Case

In the terminal phase of its trajectory, the missile's accuracy will be measurable in terms on the order of a meter, owing to a (Thomson, or SAT, or...?) infrared-imaging seeker. All risk of collateral effects for populations will be eliminated, since, in the event of malfunction of the seeker, the navigational radar will resume flight control of the missile toward the target, with a precision that would still be on the order of a decameter.

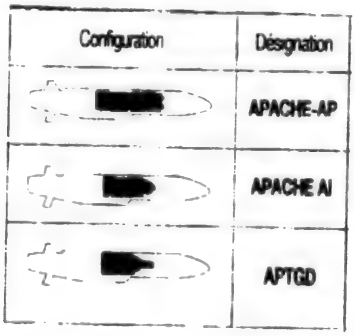
The APTGD will therefore be an expensive weapon, not to be utilized other than in exceptional cases. Hence the interest attaching to the anti-infrastructure Apache missile, a leaner version for cases permitting more conventional use.

The characteristics of the military payload of both versions will be practically the same: a 400-kg single-unit penetration charge capable of piercing a 1.80-meter-thick concrete wall. But the navigation system [of the leaner version] will consist of a simple inertial system corrected by altimetric

correlation and by radio navigation signals emitted by American Navstar/GPS satellites. The stealth characteristics of both versions would of course be the same. Terminal guidance [of the leaner version] would be provided solely by an infrared-imaging seeker. Its design being simpler than that of the APTGD, the anti-infrastructure Apache could be ready for mass production by year 2000.

The Apache Missile Tribe

Designation	Mission	Guidance	Total Weight	Payload Weight	Altitude	Precision	Range	Start of Development	Mass Production
APACHE-AP	Anti-runway	Cruising: Inertial plus radar cartographic and altimetric correction. Terminal: Millimetric radar.	1,240 kg	Multiple: 60 kg	30-60 m	10 m	140 km	1989	1997
APACHE-AI	Anti-infrastructure	Cruising: Inertial corrected by GPS and altimetric correlation. Terminal: Infrared imager.	1,150 kg	Single: 400 kg	50-100 m	3 m	+300 km	06/1995	1999
APTGD	Warning strike	Cruising: Inertial plus radar cartographic and altimetric correction. Terminal: Dual-mode: infrared imager plus prepositioning by millimetric radar.	1,200 kg	Single:400 kg	30-60 m	1 m	400-600 km	01/1995	2001



With the anti-infrastructure version, Noel Forgeard, CEO of Matra Defense Espace, gains a trump card in the call for bids on the CASOM [Conventionally Armed Stand-Off Missile] program, recently issued by the British Secretariat of State for Defense. This calls for a long-range conventional missile for arming the Tornado, Harrier, and other Eurofighters. But primarily, the British want an "off-the-shelf" solution not involving payment of development costs.

Matra's bid therefore gains credibility. Noel Forgeard, who expects to finalize his company's alliance with British Aerospace [BAe] around the beginning of the year, is venturing to state that: "We shall be together with BAe in the competitive bidding on CASOM based on a joint product inspired by the Apache." It must be noted, however, that as of now, the two partners-to-be are officially rivals in the bidding for this contract, BAe being currently associated with GEC-Marconii, which is proposing a competing missile, the Pegasus, a derivative of the airborne weapon developed for Abou Dhabi. The future of the Matra-BAe wedding is decidedly dependent upon the CASOM program, and the launching of the anti-infrastructure Apache is a line clearly being cast across the Channel by France.

[Box p. 51]:

Communique by the Ministry of Defense

During a meeting participated in by the Ministry's high officials directly concerned, Francois Leotard, minister of State, minister of Defense, was presented, at his request, with the documentation concerning the future long-range high-precision missiles.

These missiles being characterized, as they are, by secure distancing, high precision, and a marked technological superiority, under consideration is the first large-scale application of the concept of use of conventional forces as part of a strategy of action.

Based on the hypotheses of engagement of Forces advanced in the White Book, this examination addressed military needs, a technical and financial comparison of the different possible choices, and their industrial and international implications.

The study addressed the different operations identified in the Long-Term Planning Law: a long-range high-precision cruise missile (APTGD), an anti-infrastructure version of the Apache missile, and a future supersonic antiship missile. The programs could be carried out cooperatively.

The minister also requested the presentation for his approval during the month of January 1995, and in accordance with standing procedures, of a draft document detailing the launching of the program and consequences of the choice of a subsonic APTGD derived from the

Apache. This choice is to be confirmed depending on the results of a negotiation, particularly a financial one, with industry.

Germany, France Discuss Joint Satellite Reconnaissance System

95WS0135A Duesseldorf VDI NACHRICHTEN in German 9 Dec 94 p 3

[Article by Wolfgang Mock: "Europe Looking for Independence in Satellite Reconnaissance; French and Germans Plan Construction of Military Satellite System"]

[FBIS Translated Text] *Together with France, Germany plans to enter the military satellite reconnaissance system arena. The decision was to be made as early as the discussions between the French President Francois Mitterand and Chancellor Helmut Kohl last week in Bonn. However, unclarified financing is delaying the project.*

As early as 1989, Juergen Ruttgers had "no doubt" that the Federal Republic of Germany had "a basic interest both in a functioning space-based environmental monitoring system and in its own access to the military reconnaissance data of satellites." At that time, Ruttgers was just a representative. Today, he is Minister of Research.

For this reason, he will be reminded of these words frequently in the coming weeks. Together with the French, the federal government is planning the construction of a system of military reconnaissance satellites which are to provide precisely that: independent access of the Europeans to military reconnaissance data. Until now, they could only get these data from the Americans.

As early as 1984, the French tried to persuade Germany to enter into a joint venture for the construction of a reconnaissance satellite, Helios I. At that time, the federal government refused. Helios I was an optical satellite and, because of this, could not be used for reliable reconnaissance as it was purely a satellite for nice weather. In March of the coming year, Helios I is to be launched into space on the European booster rocket Ariane.

By the end of the eighties, the French started a follow-on project, Helios II. They also started Osiris, an X-ray satellite. Italy had a 14-percent share and Spain a 6-percent share of Helios II. However, the Spanish left the project in the summer of this year and the Italians are still delaying. After this, the French offered the Germans a share of Helios II. The Germans, however, also wanted to participate in the X-ray satellite Osiris, which is substantially more attractive in a technology sense.

All told, there are five elements in the satellite system being discussed by the French and Germans:

—Helios II, a satellite with an optical panchromatic sensor that can be supplemented by an infrared sensor. This satellite is used to obtain basic global information and should have a resolution of less than 1 m. It should also be able to distinguish altitude differences of less than 2 m.

—Osiris, an X-ray satellite suitable for use in all weather conditions. It can even penetrate fog and clouds and has a resolution of less than 3 m. Helios and Osiris fly in an orbit of over 800 km in altitude.

—Added to these is a data relay satellite in geosynchronous orbit (36,000 km). Without this satellite, evaluating the data in real time is not possible. The transmission capacity should be at least 500 Mbits/s.

—A ground station that evaluates the data and—in the event of military missions—ensures the conversion of the data into intelligence images or information in less than 3 hours.

—An additional option still being discussed are lightweight satellites with a spatial resolution of at least 3 m.

Two of each satellite must be in operation at the same time to ensure large areas of coverage and quick information.

The French are not the only ones trying to win over the federal government for their project. Even German industry did not stand idly by during the German-French summit last week in Bonn. For some time, the Daimler subsidiary German Aerospace (DASA), together with its director Juergen Schrempp, has been working together with the French government holding company Aerospatiale on a German-French consortium in the area of satellite construction and military guided missiles. There is already a similar joint venture in the area of helicopters.

The headquarters for the company responsible for satellite construction is to be in Munich. However, the German management in such a joint venture is only then ensured, from industry's point of view, if the federal government shows a "substantial commitment" in the military satellite area.

Precisely for the joint venture in the X-ray satellite Osiris, the Germans would have several contributions to make. Whereas Helios II is a further development of the French civilian SPOT satellite, DASA is in the lead in the more advanced technology of multi-frequency microwave X-ray satellites. In the spring of this year, three comparable X-ray sensors of the German Aerospace were in operation: in the U.S. shuttle Endeavor, in the European X-ray satellite ERS 1, and in a Dornier airplane.

However, money for the required "substantial commitment" on the part of the federal government is lacking. The French want the Germans to have a 20-percent share of Helios and the Germans want a 50-percent share of Osiris. In industry estimates, 450 million German marks [DM] would be needed for two Helios II satellites and a good DM750 million for one Osiris satellite. The Helios satellites are to be launched in 2001 and 2003, Osiris in 2004.

However, the 1995 budget still lacks the money. For this reason, Chancellor Helmut Kohl has announced "additional discussions in the next weeks." The question as to

which departments should be committed is still unanswered. The space budget of the new Minister of Technology, Juergen Ruttgers, has been stretched to the breaking point for years. The Defense Ministry has already declined, reports DIE WELT.

In addition, whether the true costs are known is already in doubt. For the petition for a referendum by natural scientists called "Responsibility for Peace," Dieter Engels and Juergen Scheffran from the Ianus Research Group of the Technical College of Darmstadt have presented a comprehensive study of Helios II and Osiris. They criticize not only that the calculations of industry did not include the costs for the ground infrastructure and use of the satellites. They also assume substantially greater development and manufacturing costs of up to DM20 billion.

They based these figures on internal calculations by the Western European Union (WEU). The WEU is the military arm of the European Union and is to operate this satellite system. Since the end of the eighties, the politically insignificant WEU has been pushing the construction of a European satellite monitoring system so as to become independent of American reconnaissance satellites. Since the Treaty of Maastricht that made the WEU an "integral part" of the Union and since European nations have been sending their troops to crisis areas, this demand has become louder and louder. For this reason, the WEU equipped its own satellite center in 1992 in Torrejon near Madrid. This center evaluates satellite data. In May 1995, at the next meeting of the WEU, the European defense ministers will make a decision regarding the construction of the satellite system and continued operation of Torrejon.

Until then, the German and French governments must make a decision. Chancellor Kohl was confident last week after his discussions with Mitterand. He said that by "March of next year at the latest" he will have dealt with the problem.

Photo caption:

Helios I (illustration) is a French reconnaissance satellite that will be launched in March 1995. France—with German participation—now wants to develop a new generation of reconnaissance satellites.

France: Fluidized-Bed-Coal-Combustion Power Plant Presented

95WS0142B Paris INDUSTRIES & TECHNIQUES in French Dec 94 p 26

[Article by Philippe Beaufils: "World's Largest Coal-Burning Boiler"]

[FBIS Translated Text] **EDF [French Power Company] has set a world record. Its Provence boiler will be the largest in the world to utilize the circulating fluidized-bed process. The process reduces the volume of pollutants emitted during combustion of mediocre-grade coal.**

In late 1995 Gardanne, near Marseille, will witness inauguration of the largest thermal power plant to utilize circulating fluidized bed (LFC) technology. This process (see box below), developed by the Lurgi company, has been known for 10 years and is in use at almost 200 sites around the world. Most units in use are industrial coal-fired boilers generating power in the range of several tens of megawatts; a few produce up to 125 mW. Thanks to EDF's research and development effort and financial assistance from Europe's "Thermie" program (130 million francs [Fr] for this application), capacity will be increased to 250 mW, doubling the previous maximum installed power. The plant is being built by Soprolif, which is owned by EDF, Endesa (Spain's power company), Houilleres du Bassin du Centre et du Midi [Coal Mines of Central Basin and Midi], and GEC-Alsthom Stein Industries.

LFC technology presents two major advantages, one economic and the other environmental: It allows utilization of high-sulfur-content, poorly combustible coals, as well as other petroleum products (tars) that might supplement the coal, without creating unacceptable environmental pollution. "The Gardanne power plant is a typical example of how Thermie can help," explains Daniel Levy, general manager of Soprolif, lead contractor for the project. "The existing 250-mW station that went into service in 1967 was nearing the end of its useful life. But it was given a second wind with LFC technology, which enabled it to conform to Europe's new pollution standards." The coal used at Gardanne has high sulfur content, produces a large quantity of ash, and is relatively weak in caloric output. All these characteristics combined made it difficult to get the coal to burn clean. The LFC process used in the new plant will reduce sulfur oxide wastes by a factor of seven; nitrogen oxide emissions will be cut in half. Also, the particle recovery rate will increase to 99.9 percent, while the desulfurization rate will reach 97 percent (versus 60 percent for the nearby 600-mW power plant).

This type of project, which required much testing and computer modeling by EDF and GEC-Alsthom Stein Industries, working from past experience with the 125-mW generating station at Carling (Lorraine), prefigures a new generation of larger (600-mW) power plants that will be competitive with conventional plants. But there are still a few technological wrinkles. Fluidization problems must be overcome as boiler size is increased. Likewise, heat-exchange problems need to be resolved by adding exterior beds, though there are limits to how far one can go in this direction.

The bottom line is that energy and environment must peacefully coexist. Because coal has a bright future. Though more and more European coal mines are shutting down, Europeans will be burning larger and larger quantities of this fossil fuel, mainly for economic reasons. But the quality of the coal will become increasingly mediocre with progressive exhaustion of world reserves, which are estimated at five times world oil and natural gas reserves combined. Thus, for the entrepreneurs involved, utilization of the LFC process for this type of medium-size power station, so widely used all around the globe, meets a real market need.

[box p 26]

Process Described

In the LFC process, combustion and desulfurization (removal of sulfur by limestone) are effected in a mass of solid particles kept in suspension by a strong airflow. This is the fluidized bed. This hot moving mass, into which coal and crushed limestone are introduced, is constantly being pushed toward the top of the combustion chamber by the combustion/fluidization air.

A cyclone separator separates solids from the smoke leaving the furnace. The hot particles are then reinjected into the combustion chamber to be recycled. Several exterior beds, playing the role of thermal regulators, assure thorough combustion.

Despite the relatively low furnace temperature (850°C), LFC technology provides very complete combustion of the coal and efficient desulfurization, while reducing nitrogen oxide emissions.[end box]

[box p 26]

Thermie

The Thermie program, which the European Community launched in 1990, supports the development and exploitation of new technologies throughout the energy sector. Part of the program covers solid fuels, including carbon. Through Thermie, advances are being made in a number of technologies such as creation of coal-derivative fuels, combustion proper, and gasification; ECU122 million has been allocated to 29 projects to make solid fuels more pollution-free and profitable.

Thanks to Thermie, it should be possible by about the year 2000 to reduce SO_2 and NO_x emissions by 410,000 and 430,000 tons per year respectively. [end box]

Germany: Joint EU Energy Standards Called For

95WS0132B Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German 16 Dec 94 p 8

[Article: "Pan-European Energy Community"]

[FBIS Translated Text] Bonn (Reuter)—On Saturday in Lisbon, Federal Economic Minister Guenter Rexrodt and EU energy commissioner Marcelino Oreja will sign a new charter for creation of a pan-European energy community. On Thursday in Bonn, Rexrodt explained in this respect that the energy sector is a key one for economic development and long-term political stability in the states undergoing reform. An all-embracing energy community therefore is in the interest of all countries. Energy commerce is continuing to be liberalized. Investment protection in the states undergoing reform is being adapted to western standards and the transit of power-associated energy platforms is to be facilitated. The energy charter is also to support the improvement of East-West cooperation in the areas of efficiency and environmental protection. In Eastern Europe power plants have to be modernized and oil and gas pipeline systems have to be overhauled, explained Rexrodt. As a result of appropriate measures there could be extensive energy savings without having to incur a decline in prosperity.

EU Pilot Plant Demonstrates QST-Process

95WS0147C Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German 6 Jan 95 p 8

[Article by g.h.i.: "Lighter Steel Beams"]

[FBIS Translated Text] Frankfurt. The development of a European Community-funded rolling process for steel beams called QST (quenching and self-tempering treatment) has been a success. A pilot program with a gray rolling mill yielded at Arbed SA (L-2930 Luxembourg) profiles which weighed roughly 30 percent less than conventional ones while having the same density and a very good weldability. Going from the computer model, the cooling and deformation of the steel during the rolling process are regulated by the computer program. Fewer alloy elements are added to the melt, which permits a reduction in the carbon equivalent. This in turn improves weldability substantially. The strength of the steel is allegedly not compromised by the welding. In flame cutting, pre-heating done to prevent fissuring can be dispensed with. Strength and toughness of the material are from the profile cross section extremely even and can be influenced in a very targeted way. Mechanical processing and deforming of the new steel beams with heat are still possible as before, especially since their strength properties only change beyond 700°C.

France: CIRTES Rapid Prototyping R&D Center Actions Noted

95WS0142C Paris INDUSTRIES & TECHNIQUES in French Dec 94 p 48

[Article by Mirel Scherer: "Technology Transfer Allied to Research"]

[FBIS Translated Text] **CIRTES [Esstin Center for Engineering, Research, and Transfer] has the resources and expertise necessary to handle draft designs, modeling, and mechanized fabrication. It is the only French center of its kind to have received the CRITT [Regional Center for Innovation and Technology Transfer] seal of approval for rapid prototyping.**

Built up from scratch in 1992 by Claude Barlier, the youthful and dynamic head of the engineering and production research team at the Erin Laboratory in the Advanced School of Engineering Sciences and Technologies at Nancy (Esstin), CIRTES has decided to locate in Saint-Die-des-Vosges, in an area populated by many small and medium-sized engineering and plastics enterprises known for the high-end machining equipment they use. "Anyone that wants to jump into this field has to realize that the competition is brutal," warns Claude Barlier. "It's not enough to have expertise in a domain like CAD/CAM [computer-assisted design and manufacturing] or five-axis machining; it's also essential to have on your team an expert in 'financial engineering,' such as Jean-Michel Maucourt. While it didn't take long for us to be allocated funds from Europe (the Stride procedure) and ANVAR [National Agency for Promotion of Research], which together account for about 50 percent of the center's financing, it took 3 years before the French aid was actually made available."

Unique in more than one respect, the center, whose new installation will be inaugurated in February, has many resources for processing design drafts (3-D laser digitalization), analytical modeling (the Catia CAD/CAM platform on IBM Risc 6000 work stations, Camand computer-aided manufacturing software by Camax), and manufacturing. As the only French center to have received the CRITT seal of approval for rapid prototyping, it has broad expertise in this domain. Ranging from its patented "Stratoconception" design method (see issue No. 732) to the just-installed high-speed machining platform. "The five-axis C400 machining center, designed specially for us by Realmeca and equipped with a Precise milling spindle capable of 42,000 rpm and 12.5 kW, will allow us to better penetrate the secrets of this type of machining, which is still very murky," notes Barlier. The machine's Num 1060 CN [nodal exchange] is linked directly to the Risc 6000 CAD/CAM work station and the Camand CAM software. Another unique feature: All these resources are put at the disposal of two independent teams—one a research group (Erin MP) focusing on medium and long-term studies, the other an engineering and technology transfer group focusing on immediate industrial needs—while the two groups stay in constant contact with each other.

Industrial Uses

Many industries are interested in exploiting the center's expertise: for example Bacarrat Crystal Glassworks for rapid production of decanters and bottles, the Alain Moinier Stringed Instrument Workshop for ultrafast development (via "stratodesign") of violin sound-boxes (Cifre convention), Ravel Orthopedics for rapid prototyping in prosthesis fabrication, Eclatec for "stratodesign" feasibility studies of operational lighting mock-ups, Adda for urban furniture design, Les Escaliers Leconte, etc.

The research is also bearing other profitable fruits: At Realmeca's booth at the Educatec expo, CIRTES will introduce an experimental cutting platform. Destined for laboratories in both industry and academia that specialize in cutting techniques, the apparatus (the result of several years of research and subject of a European patent application) controls temperature, force, power, abrasiveness, and roughness. Built in collaboration with Stellram and Specitec, the Actarus kit which is the heart of the apparatus contains collection and processing software, an acquisition card, a contact gel, and five cutting plates with sensors and tools. Its price: 50,000-80,000 francs.

France: Hardening Aluminum Parts with Silicon Carbide Reported

95WS0147A Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German 6 Jan 95 p 8

[Article by g.h.i.: "Material Improvements Using Centrifugal Casting"]

[FBIS Translated Text] Frankfurt. Material properties of machine parts can apparently be improved by casting using the centrifugal casting process. In the process, an additional material can essentially just be built right in [to the orignal material] to create improvements at delimited locations. This is what the initial results of a European research program show. The project coordinator, Luc Lajoye (Les Bronzes d'Industrie, 26 rue de la Republic, F-57360 Amneville), reports that there has been success in partially hardening cylindrical and tube-shaped aluminum parts through the inclusion of silizium carbide.

In the workpieces, which could have a diameter of up to one meter and a wall thickness of up to several centimeters, zones up to several centimeters wide can be laced with the hard material through casting. The aluminum matrix volume fraction could at such locations amount to—a precisely controlled—15 to 40 percent without the carbide agglomerating.

Preceding the process were extensive investigations on how the particles of materials to be added would behave during cooling. In addition to silizium carbide, the behavior of titanium and aluminum carbides was also investigated. It is imperative that before casting the carbide granules be sheathed by another material so that they can be perfused and completely surrounded by the liquid matrix metal. Nickel, copper and nickel phosphate compounds were tested as sheathing materials.

Germany: Oxygen Process Used to Harden Titanium Coatings

95WS0147B Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German 6 Jan 95 p 8

[Article by g.h.i.: "Oxygen Hardens Titanium Coating"]

[FBIS Translated Text] Frankfurt. Wear-threatened titanium surfaces can be hardened with the oxygen diffusion hardening process, reports the firm of Sulzer Management AG (P.O. Box 414, CH-8401 Winterthur) in its company publication SULZER TECHNICAL REVIEW. The oxygen diffuses in the course of the process to a depth of 0.03 millimeters into the titanium surface. In trials with knee joint protheses, almost no wear appeared with pairings of titanium and plastic materials as well as bearing metals. This was also the case for parts on textile machines which risk wear from friction from thread or yarn and which have up to now been protected by tipped hard metal plates. Sulzer also considers the ODH process an alternative to plasma coating (PVD) [physical vapor deposition], whereby a very thin titanium nitride layer is vapor-deposited on the substrate material.

UK: New-Type Cement Protects Metals Against Rust

95WS0140A Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German 2 Jan 95 p 10

[Article by "J.Rh.": "Nearly Rust-Free for 100 Thousand Years. Nuclear Waste in Underground Storage Sites Covered With Special Cement"]

[FBIS Translated Text] London—Covered by a new type of cement, steel in an underground storage site can be protected so that it will rust to a depth of no more than a millimeter in a hundred thousand years. United Kingdom Nirex Limited in Holmrook, Northwest England, announced this research result. Nirex is a joint offshoot of the British nuclear power industry and the British nuclear agency. It is presently studying an area in the vicinity of Sellafield as a possible dumping site for nuclear waste. The special cement developed by Nirex for backfilling the dumping site consists of a mixture of specific proportions of cement, ground limestone, lime and water. In a five-year development program it has demonstrated such good physical and chemical properties that a patent has been applied for.

The low rust formation of a hundred thousandth of a millimeter per year on grade AISI 316 stainless steel can be maintained even with a relatively high chloride content of the groundwater and at temperatures of up to 80°C. These conditions represent the extreme state of affairs that would exist in a storage site in this area, the company reports. Containers with nuclear waste have to remain undamaged in interim storage on the surface for up to 50 years. Then they have to remain intact for another 50 years after they are stored in an underground storeroom—surrounded by cement. The cement causes highly alkaline conditions in the storage sites. A typical 500-liter-capacity container consists of stainless steel and has a wall thickness of 2 to 3 millimeters.

Nirex has had two types of rust studied: pitting and general corrosion. Pitting is more aggressive, but needs oxygen. It stops when all the oxygen has been used up. In the case of general corrosion, when the environment has become anaerobic, the attack quickly subsides and the steel responds by forming a thin film of magnetite on its surface.

France: CSA-Leti's Optical Silicon-Engraved Gyrometer Presented

94WS0142D Paris INDUSTRIES & TECHNIQUES in French Dec 94 p 79

[Article by Thierry Mahe: "Optical Fiber Engraved in Integrated Circuit: Silon Gyrometer Technology"]

[FBIS Translated Text] **For guidance, determination of trajectory, and automatic suspension control, the automobile needs robust, inexpensive sensors. LETI [the Atomic Energy Commission's Microelectronics Laboratory] is working to develop a new generation of integrated silicon sensors.**

Aeronautics makes use of costly, high-precision components; automobiles get by with inexpensive, less accurate components. Except—and though it is a small point it is an important one—aeronautical technologies, such as navigational assistance systems, automatic regulators, radiocommunications, tend to find their way into automobiles. So the inertial units designed by Sagem, Thomson or Sextant Avionics will soon make their way, in simplified form, underneath the hood of your car. Sensors are key to transferring the avionic technologies. Thus LETI has designed an all-optical gyrometer engraved on silicon. Such devices measure the speed of rotation. In the horizontal plane, they determine the vehicle's direction of motion. Vertically, they indicate roll and pitch of the vehicle body. Such sensors eliminate the need for mechanical linkages with transmission or steering systems. They also substitute for other components, like accelerometers, whose readings must first be processed (integrated) to be used by the computer.

The latest generation of gyrometers and other inertial units found on airplanes is based on laser and fiber optic technologies. It is the latter that LETI has adopted, using the Sagnac effect to advantage. A single turn around its axis of a circular optical guide induces a phase variation in the light proportional to the surface of the turn and its rotational speed. Hence the idea, as a means of increasing the sensor's sensitivity, to multiply the number of turns. Since the loss of luminous energy in the fiber is proportional to its length, a simple calculation—assuming constant surface area—yields the optimum number of turns. However, the problem is complicated by the nature of the technology being used. Unilayer, it does not accommodate stacking of fibers: thus the idea of a spiral. A layer of silicon dioxide is deposited on a substratum of silicon by "deposition on plasma in vapor state reinforced by plasma" (the PECVD [plasma enhanced chemical vapor deposition] process, developed at LETI). The heliform silicon dioxide deposit serves as the optical guide; next it is covered by a superstratum. The light-emitting diode can be integrated into the "chip" [as printed in English] or separately attached. The same is true for the photoreceptive diode at the other end of the fiber. The whole ensemble sits on a disk 3 cm in diameter that contains seven coiled spirals. Soon the sensor will take up only 1 cm^2. The leakage loss in this "hard fiber" is colossal by comparison to what is obtained with traditional technology: 3 transmission units per meter versus a few transmission units per kilometer! But, as Patrick Pouteau, designer of the apparatus, boasts, "with this procedure we can take the light a distance of 80 cm, which is a real achievement!" Another problem solved by LETI: Like everything that moves over a unilayer surface, the returning light must traverse all the coils to get back to the end of the guide—and at every turn more light is lost. But these losses have been minimized.

For a year now, PSA [Peugeot] and Sextant Avionics have been financing this research project with a view to industrializing the process. By 1996 or so, LETI's integrated gyrometer will be built into a "chip" and cost only about a hundred francs. Given the mediocre precision inherent in the process (comparable to that of mechanical sensors found on today's automobiles), the sensor will not be accurate enough to use in guidance or trajectory determination systems. But it will be very useful in "attitudinal" calculations, i.e., detecting turns and registering their magnitude. Such sensors will have direct applications in the automotive (automatic suspension, for example) and robotics sectors.

Germany: Karlsruhe Nuclear Research Center Renamed

95WS0139B Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German 19 Dec 94 p 8

[Unattributed article: "Research Center with a New Name"]

[FBIS Translated Text] The Karlsruhe Nuclear Research Center (KfK) will be known as the "Karlsruhe Research Center for Technology and the Environment" starting 1 January. According to a bulletin from the large-scale research facility, the name change demonstrates that the federal government and the Land of Baden-Wurttemberg as partners have taken into account that the work focus of the Center has changed significantly in the past decade. This focus now lies in the areas of the environment, energy, microsystem technology and basic research. The portion of nuclear research and technology has been reduced to less than 20 percent of the overall program.

Germany: New Element Reported from GSI Darmstadt

95WS0132D Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German 22 Dec 94 p 8

[Article: "Record Atom from Darmstadt"; Subheads: "Element 111 Is Currently Heaviest Atom"; "Produced in Accelerator"]

[FBIS Translated Text] Darmstadt—Just one month after discovery of chemical element 110, scientists from Darmstadt have again produced a record atom: element 111. Production of what is currently the heaviest known atom was the success of researchers at the Society for Heavy Ion Research's (GSI) accelerator. The GSI has reported that the element with the record periodic-chart number of 111 (number of protons in the nucleus) is chemically related to gold and copper and disintegrates after just four thousandths of a second. Its nucleus is 272 times heavier than the lightest element, hydrogen. Production of the five heaviest elements of the periodic chart is now credited to the Darmstadt facility, the only one of its kind in the world.

To produce the new superheavy nucleus, a bismuth foil was bombarded with highly accelerated nickel nuclei. Only after "sustained fire" all day long were the researchers able to verify a total of three atoms of the new element 111. They use the artificially produced elements to examine their assumptions about the structure of the atomic nucleus. The goal is an element with periodic number 114 that should have remarkably new properties and not disintegrate quite so fast. Experts refer to an "island of stability."

Only elements with periodic numbers up to 92 (uranium) occur in nature. In heavy atomic nuclei the attractive forces overcome the repulsion of the positively charged protons. Exceptions are possible, however, in the case of specific superheavy atoms since the protons and the electrically neutral neutrons cluster into shells and are therefore able additionally to stabilize the nucleus so that it holds together for at least a few milliseconds.

The GSI in Darmstadt has carved out for itself in past years a leading position in this field of nuclear physics. With its one-of-a-kind accelerator and special measurement processes it has, since the eighties, produced the five heaviest elements known at present. They are: Nielsbohrium, with periodic number 107; Hassium (108); Meitnerium (109); and the still unnamed elements 110 and 111.

Germany-UK: Joint Research Project Searches for Rest Mass in Neutrinos

95WS0140B Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German 2 Jan 95 p 10

[Article by "oel": "Do Neutrinos Have Rest Mass After All? British-German Research Refutes Previous Suppositions Concerning the Properties of These Elementary Particles"]

[FBIS Translated Text] Frankfurt—Neutrinos originate together with neutrons in a number of nuclear reactions. While thus far it has been assumed that they, like photons, do not have their own rest mass and an electric charge, doubts have now arisen about this view. In the Karmen (Karlsruhe-Rutherford Medium-Energy Neutrino Experiment) neutrino experiment, during neutrino detection reactions were observed that occur with a time lag, and, with less than 100 signals in four years, are very rare.

Because these signals are not compatible with the currently accepted ideas concerning the behavior of neutrinos, it is presumed that there are after all neutrinos that exhibit rest mass. Contrary to today's hypothesis, this could mean that the universe is not only expanding, but that it also could contract or implode.

Neutrinos are elementary particles from the group of light elementary particles and are one of the leptons that weakly interact with other elementary particles. In addition, electrons, muons and tauons are counted among the same group. Neutrinos were first observed in radioactive beta decay. One can account for and determine the energy content by their means, when in nuclear reactions a proton decays into a neutron or a positron into an electron. A corresponding antineutrino also exists in addition to this neutrino. In addition, two additional neutrinos and their antineutrinos from the decay of muons and tauons—the mu and tau neutrinos—have been postulated.

In return, corresponding elementary particles like protons, muons or tauons originate from neutrinos and neutrons in the reverse reaction. Neutrinos fly in large quantities through the universe and together with neutrons also penetrate into the deepest strata of the earth. However, because, as "weakly interacting" particles, they react only rarely with other elementary particles, they are very difficult to detect. The absorption of their radiation on the earth is being

tracked in large tanks filled with gallium, from their reaction of the transmutation of gallium into germanium.

Neutrino formation is being investigated in the Karmen experiment in connection with the Rutherford Institute's neutron spallation source. A tank filled with 60 tons of petroleum was used for this purpose and neutrino reactions were detected from the flashes of light that occur, which can be registered by means of photodetectors. The tank was protected from the penetration of other elementary particles by a 7000-ton steel shield.

In the opinion of the German and English physicists taking part in the experiment, the rarely occurring flashes of light observed indicate that tau neutrinos are involved, whose rest mass could possibly be on the order of magnitude of less than 30 electron volts. However, they emphasize that confirmation is still pending from other research institutes, and perhaps with differently designed registration techniques. Now they want in particular to make the photodetectors more sensitive so that they can register flashes of light more quickly and reliably, and in addition to refine the analysis methods in order to be able to better filter out background noise. For further information: Kernforschungszentrum Karlsruhe GmbH [Karlsruhe Nuclear Research Center, Ltd.], D-76021 Karlsruhe.

Successes, Future of EU's JESSI Program for Semiconductors Viewed

95WS0138A Duesseldorf HANDELSBLATT in German 22 Dec 94 p 6

[Unattributed article: "Success Is Supposed To Justify State Intervention in the Electronics Market"]

[FBIS Translated Text] Munich. Friends of the pure theory of the market economy don't like JESSI. In the "Joint European Submicron Silicon Program," or JESSI, a whole branch of industry cooperates and distributes public funds to coordinate its work on chips, equipment and applications.

This concerns not only theoretical principles but also processes and products close to the market. But because this has resulted in Europe's semiconductor industry's getting into full swing, becoming competitive and even making a profit in 1994, all participants are convinced they were doing a good deed which should be continued in the future.

"Europe has no choice," says Heinz Hagmeister, chairman of the JESSI board, in an interview with HANDELSBLATT, speaking in agreement with his successor, Guy Dumas, who will take over the JESSI chairmanship in 1995.

"As long as chips are subsidized by public funds all over the world, our industry can only compete if it is assured roughly similar conditions." This is not only about public funds expended quite generously, especially by Asian countries and the American Department of Defense, but equally important is the cooperation of the Europeans, says Hagmeister, and "after the expiration of the JESSI program in 1996 too, close cooperation in the semiconductor line is necessary".

Almost All Projects Finished On Time

In 1994, JESSI supported 73 projects in which 180 firms and institutions from 16 countries worked for a total of 3100 man-years. Hagmeister: "Ninety percent of the projects were completed on time, while completion of the others was delayed by three months at most."

Semiconductors: In the production of 0.7 micron CMOS [Complementary Metal Oxide Semiconductor] circuits, the processing time for silicon wafers was reduced by 40 percent and the utilization of the production facilities was improved by 80 percent. Currently, JESSI has started to produce the 0.5-micron chips and is already preparing the production of the still finer structures of 0.35 micron. All European manufacturers, from Alcatel Mietec [Microelectronics Technologies], ES2 [European Silicon Structures], GEC Plessey, IBM, Matra, Philips, SGS-Thomson and Siemens to Temic Telefunken, are then working together.

Digital Audio Broadcasting and Information Highway

Communication: Among the most important projects are chips for Digital Broadcasting DAB, the Global Mobile Radio GSM and the Asynchronous Transfer Mode ATM used in the ISDN [Integrated Services Digital Network] networks for rapid transmission and on the "Information Highway." Hagmeister's opinion: "Europe has meanwhile attained in communications a leading position in the world."

Applications: Among the JESSI projects are the Computer-Aided Design CAD, as well as expert systems, the so-called "Artificial Intelligence," for simulations. In the production of application-specific circuits, the ASICS, support was provided for 2,000 small and medium-size companies in ten countries by 300 seminars with 6000 participants in which 100 ASICS were manufactured with JESSI CAD.

Material and equipment: Suppliers cooperate in 30 projects, among them Wacker as the largest supplier of silicon wafers with a diameter of 200 mm (12-inch wafers), as well as Schlumberger-ATE and ASM-L in test equipment, Leybold with plasma etching, and the specalists for gases and chemicals.

During the last two JESSI years, means have tightened up. In 1995 JESSI will not be able to spend more than 470 million ECU, or 7 percent less than in 1994, for projects in the five most important countries: Germany, France, Italy, England, and the Netherlands, because the Netherlands and England have cut their appropriations. In 1996, the last year of the JESSI program, the budget could shrink once more, since "the better the position of the chip industry, the less inclined will the government be to spend something for development."

Cooperation Necessary Also After JESSI

Although Europe is technologically competitive today, "the market share is still too small, and the chip technology is developing at such a rapid rate that competitiveness could easily be lost again in two years.

"For the period after JESSI, beginning in 1997, Hagmeister agrees with industry that at the very least cooperation must be continued, including products quite close to the market. "Systems like Digital Audio Broadcasting or the 'Information Highway' cannot be introduced into the market by one company alone and not without assistance from the government." The state must help with standardization and the companies have to agree on compatible systems. "That may not fit into the pure doctrine of market economy, but the alternative would be Europe's retreat from semiconductor production and the taking over of ready-made solutions from Japan and the U.S."

Critics see JESSI as an "industrial policy" under control of the industry itself and fear assistance without end. The chip manufacturers and their suppliers dismiss such fears and are convinced that the European semiconductor industry has no alternative: Success has to justify the means or Europe would have to forego the most important industry of the future.

EU's Ruberti on Strengths, Weaknesses of European Researc

95WS0131A Stuttgart BILD DER WISSENSCHAFT in German Jan 95 Supplement pp 10-11

[Interview with Antonio Ruberti, European Research Commissioner, by Reiner Korbmann; place and date not given: "Invest in the Future. New Programs for Global Competition"; first paragraph is an introduction]

[FBIS Translated Text] **Instead of two hostile power blocs, three industrial powers control the picture of the world, today and into the future. Europe must respond to this with investment in research and education, in order to be prepared for the peaceful competition of the future, stresses European Research Commissioner Professor Antonio Ruberti in a conversation with BILD DER WISSENSCHAFT.**

[Korbmann] Professor Ruberti, Europe is facing new challenges because of global political changes and technological change. How can research help to cope with this?

[Ruberti] We have investigated Europe's new role and in the process recorded strengths and weaknesses in the "White Book on Growth, Competitiveness and Employment." I see three weaknesses vis-à-vis Japan and the U.S.: first, we are putting too little money into research; second, research policy in Europe is fragmented; third, in Europe we have developed too little the ability to turn research results into industrial innovations.

[Korbmann] Can you talk about this in greater detail?

[Ruberti] The U.S. and Japan are making fools of us in all three points. Around three percent of their gross national product is spent on research there, while it is on average only two percent in Europe. Research policy is directed and financed with uniform objectives there, while among the 12—soon to be 16—nations of the EU each is pursuing its own research policy objectives. Just four percent of the research budget is going into the European Union's joint research. Even if one counts the European Space Agency (ESA), ESO [European Southern Observatory], EMBL [European Molecular Biology Laboratory] and the CERN [European Particle Physics Laboratory] nuclear research center or the EUREKA [European Research Coordination Agency] research program, one comes to barely more than 12 percent. In the U.S. there are also very much better capabilities for turning research results into marketable products through venture capital or joint ventures.

[Korbmann] Does Europe have strengths too?

[Ruberti] Of course, there are strengths opposite these three weaknesses. I see mainly two: first, the excellent level of basic research, and, second, the great diversity of research. This is a vast resource that in the long term will speed the progress of creativity. But, of course, we have the problem of finding a balance between diversity and splintering.

[Korbmann] Do you see a way?

[Ruberti] I see even two ways. The fourth overall program for European research is the obvious one.

[Korbmann] What will that do?

[Ruberti] The European Community's Fourth Overall Research Program, which was passed recently, is targeted specifically against Europe's weaknesses. For instance, we have increased considerably the amounts budgeted for research, to 12.3 billion European currency units [ECU] (approximately 25 billion German marks [DM]). I think that with this we have achieved the maximum that is possible at present in view of the ubiquitous financial problems. In addition, we are using three percent of the research money, and one percent of the specific programs in addition, for encouraging the turning of research results into applications.

We have focused on the most important fields. Fifty percent of the money is going into computer science, telecommunications, biotechnology or environmental research. Because these sectors are the most important industrial growth areas, that will bring about new jobs.

The inclusion of socioeconomic research in subsidies is another change. It has been barely supported with community funds thus far. Now we are setting three priorities: technology assessment and forecasting as well as assessment of the consequences of technology; research on upbringing and education; and the study of social marginalization. There is already a contradictory trend: on the one hand we are creating a super-Europe, and, on the other, nationalism and even localism are growing. We have to learn to understand this in order to respond properly.

[Korbmann] You mentioned yet another second way.

[Ruberti] Yes. We passed a document titled "From Cooperation to Coordination." In the future we have to come to a minimum of coordination if we want to survive in the competition. The first steps have already been taken in the high-performance computers with CERN and in an environmental protection satellite with the ESA, for example.

[Korbmann] How do you rate basic research, then, and application-oriented research?

[Ruberti] That is difficult. At the moment research has to support, above all, the industrial sector too so that we can survive in the competition. At the same time basic research must not suffer. In no case should we solve just the problems of the moment. On the other hand, if the application of research results does not bring in enough, we will also no longer be able to finance basic research.

[Korbmann] What role does joint research play in Europe's growing together culturally?

[Ruberti] Europe is the homeland of modern science, the universities, the academies, the entire research system. The European Union has to regard research too as part of the culture. That is why it is necessary to make the problems of science too understandable to a broader

public. Otherwise, we will soon get difficulties with questions like ethics or the acceptance of technology.

At the same time we want to encourage the debate concerning research, especially the problems that arise between science and society. For example, we organized a forum in London on the role of scientific experts in policy—a frequently unappreciated problem.

[Korbmann] At the end of the year you are finishing your work as EU commissioner for research. What were your greatest achievements?

[Ruberti] The two years were a great challenge for me personally, the climax of 18 years that I spent in science policy. The fourth overall program passed in my term. It is also very important that it was possible to simplify the procedures for the subsidizing of research. I add to this the European Science Weeks too. But for me the most important achievement was the founding of the Scientific Assembly of Europe. It has provided regular communication between the scientific world and the European Commission. There has been talk about it for eight years. Now we finally have it. But, of course, there are still things that one would have liked to have seen done. For me this includes, for instance, a plan for cooperation between the member countries through additional programs such as are designated in the treaty but as yet have never been implemented, and through which funds from the member countries and the union could be mobilized simultaneously.

[Korbmann] What is your bottom line?

[Ruberti] One above all: Keep education and science assembled under one roof. The capital of the future is knowledge and proficiency, i.e., research and education. We must prepare ourselves better for the future, invest for the future. And that means the amassing of intangible capital through research and education. We must be willing today, too, to make sacrifices. We have to think about our competitiveness tomorrow and the day after tomorrow. Research and education are the new wealth of our nations. And we are still doing too little here.

Note: Antonio Ruberti is ending his term as European research commissioner on January 24, 1995; active in science policy for 18 years, first as rector of Rome University, then as Italy's research minister, and finally in the European Commission.

SPD's Glotz on German Research Policy, Biotechnology Obstacles

95WS0150A Duesseldorf WIRTSCHAFTSWOCHE in German 22 Dec 94 pp 40-43

[Interview with Peter Glotz by Martin Kessler and Friedrich Thelen; place and date not given; under the rubric "Business + Politics. Future": "Third Miracle. Peter Glotz, Scharping's Shadow Minister for the Research Ministry, on Germany's Innovation Weaknesses"]

[FBIS Translated Text]

[Kessler/Thelen] Mr. Glotz, you became only with great difficulty the spokesperson of the SPD's [Social Democratic Party's] education, science, research and technology task force. Will the weak support in your party do for standing up against Jürgen Rüttgers?

[Glotz] The approval in the parliamentary group was quite respectable with 134 votes versus 106. As for the rest, I have experience in my ideas' not being shared immediately with teary-eyed compassion by the majority of my party colleagues. The trench warfare within the party in research and education policy has ceased. And for that reason I will have no difficulty in arguing effectively with Rüttgers.

[Kessler/Thelen] Do you not first have to bring about order, for a change, in your own ranks? After all, the SPD is not putting on the brakes just at the chemicals industry and nuclear power. Your party colleagues are also mobilizing against transportation systems like the Transrapid and against genetic engineering.

[Glotz] There are reservations against these technologies in the Union too. But we have basically endorsed modern transportation systems and genetic engineering, even if we have rejected many applications. Let me remind you of the fact that the SPD-governed states of Rhineland- Palatinate and North Rhine-Westphalia above all pressed for an industry-friendly amendment to the genetic engineering law.

[Kessler/Thelen] But the understanding came to late. By now Germany has lost contact in genetic engineering.

[Glotz] But that has nothing to do with hostility to technology. Genetic engineering research has disappeared from Germany because American companies hold the most patents. They were simply more creative than the Germans. Thus far there have been 300 new business starts in genetic engineering in the U.S., and just 12 in Germany.

[Kessler/Thelen] What are the Germans doing wrong?

[Glotz] Our microbiology research is lagging strongly behind the research overseas. In addition, the financial support is wrong here. There is no venture capital for start-up companies. Unfortunately, the banks are also politely holding back.

[Kessler/Thelen] The SPD also has for the most part a closer relationship with big business than with start-up companies.

[Glotz] This must not remain so. With the rapid product cycles that are the order of the day in innovative industries, big business often just lumbers along. I am extremely sorry that Research Minister Rüttgers is applying the brakes so with, of all things, the "Technology-Oriented Companies" program.

[Kessler/Thelen] The subsidy programs for innovative companies were flops.

[Glotz] These have also not been properly thought out thus far. In order to change the innovation culture in Germany

we need a program with at least 20 different points. This ranges from bank guarantees, to making venture capital available, to the application of financial know-how for new companies. The psychology of university graduates and institute personnel is also wrong. A company is not founded in a garage by anyone who is warmed by the cloak of public service.

[Kessler/Thelen] If salvation is coming for start-up companies, why then are you preparing yourself so greatly for talks with big business?

[Glotz] One must not exclude the other. For a third industrial miracle we need both an explosion of ideas and the commercial turning of these ideas into new companies, and agreement between government and industry on the fields of the future. But I do not see how a government can make this happen that has just a 10-vote majority and in addition a completely hysterical FDP [Free Democratic Party] coalition partner.

[Kessler/Thelen] Do you want the alliance with the Union?

[Glotz] I would have no problems with CDU [Christian Democratic Union] politicians like Kurt Biedenkopf or Lothar Späth. It will be more difficult with Helmut Kohl or Wolfgang Schäuble.

[Kessler/Thelen] Biedenkopf and Späth are, like many Social Democrats, industrial policy people. But it is precisely government subsidizing of research that has brought about any number of investment ruins, such as the Fast Breeder, the EU's HDTV [High Definition Television] program or the subsidizing of microelectronics in JESSI [Joint European Submicron Silicon Initiative].

[Glotz] I reject this kind of industrial policy. The government must not wield the big moneybag. I am thinking rather of a committee, a technology council, that sits as an independent authority under the federal president. Then it is to call the problems as they are and see what the government, what business or what scientists are able to do.

[Kessler/Thelen] There is already something like this at the chancellery and at the Petersberg [hotel in Königswinter].

[Glotz] We still have to wait for whether the informal group at the chancellery will be upgraded to the technology council. And at the Petersberg one minister let 40 highly paid managers wait for an hour while his colleague rushed off an hour earlier. The cream of Germany's industry can do without such rounds of chats.

EU: Unfamiliarity Delays Breakthrough of Electronic Data Interchange

95WS0139C Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German 29 Dec 94 p 8

[Article by Jurgen Kotschenreuther: "A Lack of Knowledge Has Prevented the Breakthrough of Electronic Data Interchange. Critical Mass of Process. Security Hurdles Eliminated. The Path to Electronic Data Interchange"]

[FBIS Translated Text] Many companies have recognized it as a strategic element of competition. The American government is betting on its enormous rationalization effects for the public administration. In the European Union, it was given a high priority with regard to the European information society. Large growth is predicted for Electronic Data Interchange (EDI). However, it has not yet made the breakthrough. Incompatibilities and the widespread lack of knowledge about EDI are mainly responsible for this situation. These obstacles should now be eliminated quickly with appropriate initiatives by the European Union and German institutes.

EDI designates the electronic interchange of business documents such as texts, images and graphics using structured, standardized formats. As a rule, it involves documents having contents that repeat (orders, contract confirmations, proposals, delivery receipts, customs declarations or invoices).

EDI cannot exist without standards for the structure and syntax of electronically interchanged messages. In the past, a number of proprietary systems were developed. The various branches of the economy and even the public administration agreed to their standards independent of one another. In the meantime, there is the concern that the various national and international EDI initiatives are drifting apart. Primarily the European Union Commission fears that the various incompatible systems could become an obstacle to developing the domestic market.

The widespread lack of information is certainly responsible for the fact that EDI is little used in spite of the wide range of goods in comparison to conventional forms of communication (letters, faxes). It is also possible that the EDI vendors (system integrators, device and program vendors, consultants and consulting institutes such as the EU, BDI [Federal Association of German Industry], DIHT [German Industrial and Trade Association] or IHK [Chamber of Industry and Trade) have not made the available EDI range of goods and their uses clear enough to the users.

In addition, many large companies, once they have decided to introduce EDI, neglect to make the strategic utilization of EDI transparent to their suppliers and customers and to provide help in implementation. Instead of this, they try to force their partners into the EDI fold, something that is not always met with acceptance.

Comparison with the first slow, then, however, very rapid proliferation of facsimile technology allows the supposition that the slow proliferation of EDI to date is an obstacle in itself. As long as suppliers and customers are not accessible via EDI, there is no stimulus to implement EDI. The "critical mass" has not been reached.

In many cases, the introduction fails quite simply due to problems in the organization. Pronounced work divisions and, in many cases, the lack of readiness to cooperate between technical departments, the DP, telecommunications and administrative departments do not simplify the matter. Uncertainty exists in the delicate question as to which organizational changes accompany EDI and how these are to be achieved. For example, solutions must be found as to how the employees whose jobs are "saved" by the use of EDI can be employed in other capacities.

Again and again, it has been shown that holding tight to previous habits and ways of working present obstacles to a comprehensive innovation. The major portion of enterprise communication continues to take place at personal meetings, on the telephone, by fax or letter. Proposals, contracts, invoices and other business documents are still, for the most part, sent by letter or fax. Paper-bound communication hinders fast, error-free handling of business activities, causes media discontinuities, and high costs in terms of personnel, material and management by repeated manual input and output.

The security and legal problems often cited are not much of a topic anymore. Security elements are available on the market to a sufficient degree at acceptable prices. In conjunction with the legal situation, it has been possible to eliminate, to a large extent, the legal uncertainty that was widespread before. In the scope of the Tedis program of the European Union (Trade Electronic Data Interchange System) that is finishing at the end of this year, basic legal conditions and the technical prerequisites for these have been worked out for electronic data interchange.

A recommendation for an EDI sample agreement was worked out. This agreement will serve both to standardize and to lead to greater legal certainty regarding contractual regulations. It obligates the participants to maintain transmission standards and to recognize the binding nature of electronic professed intentions. The sample agreement provides that, when transmitting personal data in EU countries without a data protection law (Italy, Greece), at least the specification of the Data Protection Convention of the European Commission of 28 January 1981 will be observed.

EU: Software Firms Agree on Information Superhighway Development

95WS0129A Paris LE MONDE INFORMATIQUE in French 16 Dec 94 p 6

[Article by Phippe Guichardaz: "European SSII's Speak Out"]

[FBIS Translated Text] "It is not necessary to equip France and Europe with fiber optics and ATM switching: the information superhighway can and must start right away." This is the gist of the message given by the Group of Six[1]

(composed of eleven major European SSII's [Computer Services and Engineering Companies] to the Common Market authorities. The context of this position statement is the Bangemann report, named for the vice president of the Brussels Commission and addressing the ways and means of building the information society within the Union.

Without waiting for the development of the standards and regulations which are certainly necessary, "Europe, which already has a powerful computer software industry, also has an immediate need of applications for the information superhighway," says Pier Paolo Davoli, president of the Group of Six and CEO of the Italian SSII, Finsiel.

Philippe Dreyfus, formerly with Cap Gemini Sogeti [CGS] and founding president of the Group of Six, concurs by adding that instead of building very sophisticated infrastructures without prior knowledge of user requirements, "you have to first find customers with common needs and interests." This will make way for a second stage where investors able to meet these needs can be recruited. At this stage, the Group of Six singles out the easily identified major PME-PMI (small and medium enterprises and industries) customers which, by virtue of their numbers, are hard to locate and have very vaguely defined requirements. For this latter category of enterprises, the European SSII panel is asking Brussels to assist in financing suitable models to show to clients such as travel agencies or local communities.

Such financing could come from retargeting funds allocated to community research programs. As Dreyfus says, these programs have suffered from too much bureaucratic burden and from a lack of users, and "have not created an interesting competitive position for an SSII such as CGS." While waiting for measures to that effect from Brussels, Dreyfus feels that French government policy, with its call for proposals for information superhighway projects, is headed in the right direction. CGS, which has already implemented multimedia applications through Numeris for the Eram shoe manufacturer and for demonstrations of the travel agency of the future, is planning to submit its proposals on January 23.

Footnote:

1. Cap Gemini Sogeti, DataCentralen, debis Systemhaus, Eritel, Finsiel, Logica, SAP, Sema Group, Sligos, Softlab, Cap Volmac.

Future of Information Highway in Germany Viewed

95WS0149A Frankfurt/Main FRANKFURTER ALLGEMEINE in Germany 9 Jan 95 p 5

[Article by Joerg Schieb: "Communication, Entertainment and Consumerism with Single Piece of Equipment in Future"; Subhead: "Information Superhighway Construction Site"]

[FBIS Translated Excerpts] Frankfurt, January—[Passage omitted]

The most important data links in Germany are already being operated at 2.5 gigabits (one gigabit is a billion bits) per second, to be sure, not via copper cable but via glass fiber. At that rate it is possible in a single second to transmit not two but 82,000 typewritten pages. It takes 140 minutes to transmit an X-ray image via an ordinary analog line. It can be transmitted via ISDN [Integrated Services Digital Network] in about 20 minutes. In a single second 30 X-ray images can be transmitted via the superhighway already existing in Germany. Here is what may be an even more impressive example: a 25-minute long animated cartoon sequence entailing 25 images per second would require seven hours of transmission time via ISDN; the same cartoon is completely transmitted in not even a single second at 2.5 gigabits per second. At least it would in theory, since there are, for the most part, no end-user devices that could keep up with that kind of rate. This means, however, that what is ultimately feasible has still not been realized. Using technologies like "multiplexing," in which the glass fiber is multiple use is simultaneously made of different wave-length windows, even much higher transmission rates are practicable.

The basis for extremely high-speed data transport already exists in Germany, unlike most other countries. Even Americans are casting respectful glances in this direction. In the land of unlimited possibilities, ISDN, for example, is just starting slowly to gain acceptance, whereas over here it has already become relatively widespread. For years now, Deutsche Telekom has invested very heavily in the glass-fiber based communications infrastructure. This therefore ranks it at the top, internationally. Telekom operates Europe's biggest cable system with 14.2 million households on cable.

Missing Ingredient is Standards

For the information superhighway to become a reality an enormous infrastructure is still required and, consequently, continued strenuous efforts. What still continues to be lacking are standards to which suppliers can adhere. At present there are merely alliances, consortiums and conglomerates, each of which defines its own standards. For this reason, a coordinating panel of domestic and European engineers and politicians has to be urgently established and the differences ironed out. The European Union [EU] Commission's premise is that as early as the turn of the millenium the communications branch will have 60 million employees instead of the present 13 million individuals. Concurrently, it will surpass the automobile industry in importance. Even now the percentage of communications technology in the gross social product of some industrial countries is three percent.

Still, the infrastructure of satellites, cables and end-user equipment by itself, the "highway system" for the high-speed movement of data, is inadequate. Who is supposed to use what to speed along those superhighways? There is generally a ready answer even to this: contents. In the U.S.,

telephone and cable companies are already merging and cooperating with media outfits such as Time Warner to keep their options open here. Branches that no one until now ever has seen so close to one another, are intertwining. The question of what purpose the information superhighway is actually serving, is absolutely irrelevant. It can be used for any possibility once it is just built. Simply anything that can be digitized now or in the future, that is, data that is not just text, numbers or computer graphics but high-grade music or videos, software, games, sales offers, telephone conversations with or without images, television programs.

[Passage omitted]

Tele-Shopping After Stores Close

In the future, however, shopping will hardly require use of a PC [personal computer] as presently understood. Instead, the customer has to be envisioned as equipped with remote control in front of a self-styled telecomputer, a blend of TV, telephone, fax and PC. Products of interest are flashed on the large flat screen. Expert advice is available, in video form of course, with the press of a button. In the Federal Republic of Germany [FRG] in 1993 sales of one billion marks [DM] were realized via teleshopping. In a country that has the strictest store closing times applicable anywhere in the world, a detour via the information superhighway could quickly turn into an attractive alternative for consumers.

About 30 programs are currently available in the household having cable. Helmut Ricke, chairman of the board for Telekom, predicts that as early as 1996, Germany will have 150 TV programs, and by the year 2000 the available programs should increase to 400. The result will be special-interest TV with an unprecedented fragmentation of themes. The U.S. "Sega channel," a channel that offers video games all day long, is just a start. Expanded program availability is feasible as a result of digitizing, since digitized video data can be algorithmically compressed. In the compression process each image is no longer transmitted whole and entire, but only its modifications. The actual screen display is "computed" in the end-user equipment.

Really, however, the possibilities of the information superhighway are going to emerge first as a different concept: video-on-demand, the movie you want at home, meaning that any video whatsoever can be ordered at any time on a console. A powerful video-server at the cable operator's headquarters "replays" the digitized video on a special channel for the home viewer—and is paid for it. In the U.S. and in Great Britain there are already relevant field experiments; in Germany soon, six pilot projects will be launched in Berlin, Hamburg, Cologne, Stuttgart, Nuremberg and Leipzig. Telekom is plowing nearly DM200 million into this.

And communications? To be sure, at present this is where most of the action is since the requirements from academia and the private sector are enormous. Still, the information superhighway is often wrongly equated with the Internet, the globe-girdling academic computer network. At best, the Internet is a "model" for the information highway. Even at present there is no longer sufficient capacity. On the basis of conservative estimates, 3.5 million computers are connected to the Internet and nearly 25 million people use the net on a more or less regular basis. Monthly, more than a billion electronic messages (E-mail) stream through the computer network. The trend is soaring by leaps and bounds.

Ultimately there is the matter of who is supposed to fund all of this. The advertising industry has already been pushed virtually to its limit on current non-public TV. Hence, in the future, hands will be reaching into the viewer's pocket with increasing frequency. Suppliers such as Pay-TV-Sender Premiere, with almost 800,000 German households currently as subscribers, will therefore, in the future, be not the exception but the rule. In lieu of monthly payment allowing one to view everything, pay-per-view will emerge: you only pay for what you actually view.

[Passage omitted]

Germany: New Principle for Surface Filter Introduced

95WS0139A Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German 19 Dec 94 p 10

[Article by re: "New Principle for Surface Wave Filters. FW Dresden: The Design Software Permits Rapid Changes"]

[FBIS Translated Text] The Institute for Research in Solid-state and Materials Dresden and Tele Filter tft GmbH from Teltow have developed a surface wave filter operating on a new filter principle for mobile radio technology. They have developed this filter to where it is ready for practical use. Using surface wave filters, the arriving electrical signals are converted into sound waves. While passing over the surface of the component, the desired signals are filtered and then converted back into electrical signals. Filters of this type play a major role in the separation of receive channels.

The new filter principle involves so-called resonator filters. In these filters, wave fields at selected frequencies are enclosed between reflecting structures as in a cavity to increase the selectivity, explains the Institute for Research in Sold-state and Materials Dresden eV (IFW, Dr. Anke Hellwig, Office for Cooperation and Technology Transfer, Pf. 270 0216, 01171 Dresden / Fax: 0351/46 59 500).

It is still possible to route the acoustic surface waves into narrow conductors to limit them laterally and to utilize the transverse effects. Transversely coupled resonator filters operate using this principle. When designing such filters, conventional wisdom dictated that, with two coupled waveguides, only a single split in the filter transmission curve could be achieved. The more recent research work has shown, however, that even transmission curves with substantially more degrees of freedom can be produced.

Until today, usually standard types of such surface wave filters have been offered on the market because the sizing of new filters and converting manufacturing processes were very expensive and time-consuming. The company from Teltow and the IFW Dresden have now created design software based on a better founded, in physical terms, modeling system. This software makes it possible to react very quickly to special customer needs. This market is primarily served today by Japanese vendors.

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